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Evaluation of Final Configuration Alternatives for the 105-B Reactor Facility

United States
Department of Energy

For External Review

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United States Department of Energy
P.O. Box 550, Richland, Washington 99352

EXECUTIVE SUMMARY

This document presents the results of an evaluation of three final configuration options for the 105-B Reactor Facility pending eventual removal and disposal of the reactor core within the next 66 years. Portions of the 105-B Facility and reactor stack are contaminated with chemical and radiological hazardous substances and pose a potential risk to human health and the environment, warranting a final removal action. An interim removal action decision for an approximate 10-year time frame was documented in an Action Memorandum in 2001, which included hazard mitigation and potential public access of the 105-B Facility (DOE-RL 2001a). Although the previous Action Memorandum preserved the ability to use the facility for public access, the alternatives evaluated in this document do not include this option. In accordance with previous commitments, the U.S. Department of Energy is continuing to seek a sponsor with interest in preserving all or part of the 105-B Building for historical purposes. However, such a sponsor has not yet been identified, and the alternatives summarized in this evaluation assume that there will be no long-term public use or structural preservation of the facility. Actions evaluated in this document would not be implemented for at least 3 years, pending evaluation of additional alternatives and selection of a final removal action under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

This document describes the 105-B Facility, its historical significance, and interim action alternatives already selected for historic preservation. The document also describes site conditions and the sources and extent of contamination to provide a framework for the discussion of cleanup action objectives and alternatives. Finally, each alternative is compared against the criteria of effectiveness, implementability, and cost.

Cleanup actions evaluated for the 105-B Facility include No Action, Interim Safe Storage, and Long-Term Surveillance and Maintenance. Interim safe storage, which has been performed or is in progress at other Hanford Site reactor facilities, includes decontamination and demolition of the reactor facility up to the shield walls that surround the reactor block, the construction of a safe storage enclosure, and a reduced schedule of surveillance and maintenance. Long-term surveillance and maintenance includes an extended period of facility monitoring with major and minor repairs as necessary followed by eventual decontamination and demolition of the reactor facility. Costs for the three alternatives were determined as shown in Table ES-1.

Table ES-1. Cost Comparison for Final Configuration Alternatives for the 105-B Reactor.

Alternative	Present-Worth Cost	Nondiscounted Cost
Alternative 1 – No Action	No cost	No cost
Alternative 2 – Interim Safe Storage	$18,408,000	$18,787,000
Alternative 3 – Long Term Surveillance and Maintenance	$4,214,000	$24,213,000

Consistent with guidance established by the U.S. Office of Management and Budget, present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB 1992). For purposes of this evaluation, costs are presented in terms of present-worth and total nondiscounted costs.

The *present-worth* cost method depicts the amount of money required to be set aside at the initial point in time (e.g., in the current year) to fund all cleanup activities occurring over the life of the alternative. Present-worth analysis assumes that the funding set aside at the initial point in time increases in value as time goes on, similar to how money placed in a savings account gains in value due to interest paid on the account. Although the federal government does not typically set aside the money in this manner, the present-worth analysis is specified under CERCLA as the approach for establishing a common baseline to evaluate and compare alternatives that have costs occurring at different time frames. While the money may not actually be set aside, the present-worth costs are considered directly comparable for evaluating alternative costs.

Example:

> Assume that a cleanup alternative would incur a $20,000 cost 20 years in the future. Using a 2.9% discount rate (see note below), $11,290 would need to be set aside in the current year to have $20,000 available in 20 years (i.e., the present-worth cost of this alternative is $11,290). In contrast, only $4,789 would need to be set aside in the current year to fund a $20,000 action occurring 50 years in the future. (Note: The discount rates [interest rates] for evaluating government programs are established by the Office of

Management and Budget and are updated on a periodic basis to reflect the most recent economic predictions.)

The *nondiscounted* cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or "discounting") to reflect current year or "set aside" cost based on an assumed interest rate. Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for remedy selection purposes.

Example:

Assume that a cleanup alternative would incur costs of $10,000 per year over a 50-year time frame, with an additional $20,000 cost occurring 25 years into the process. The total nondiscounted cost for this alternative is $520,000 ([$10,000 x 50 years] + $20,000). Using a 2.9% discount rate, the present-worth cost of this same alternative is $272,102.

The present-worth costs associated with the Interim Safe Storage and Long-Term Surveillance and Maintenance Alternatives are $18.4 and $4.2 million, respectively. Total nondiscounted costs for the Interim Safe Storage and Long-Term Surveillance and Maintenance Alternatives are $18.8 and $24.2 million, respectively.

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ACRONYMS

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CWC	Central Waste Complex
D&D	decontamination and demolition
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	Effluent Treatment Facility
FR	*Federal Register*
FSB	fuel storage basin
HCP EIS	*Hanford Comprehensive Land-Use Plan Environmental Impact Statement*
ISS	interim safe storage
NEPA	*National Environmental Policy Act of 1969*
NCP	National Contingency Plan
NPL	National Priorities List
PCB	polychlorinated biphenyl
RESRAD	RESidual RADioactivity
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	Record of Decision
S&M	surveillance and maintenance
SSE	safe storage enclosure
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TSCA	*Toxic Substances Control Act of 1976*
WAC	*Washington Administrative Code*
WIDS	Waste Site Information Database

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

This document presents the results of a comparison of three alternatives for cleanup actions at the 105-B Reactor building (subsequently referred to as the 105-B Facility[1]), including the fuel storage basin (FSB) and below-grade portions of the reactor, excluding the reactor block. The reactor block will remain in a safe storage mode for up to 75 years from the date of issuance of the Record of Decision (ROD) (58 *Federal Register* [FR] 48509) that followed the environmental impact statement (EIS), *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1992). Nine years have elapsed since the issuance of that ROD; therefore, the final removal action for the 105-B Facility will be carried out within the remaining 66 years of the specified 75-year time frame. Ancillary facilities in the 100 Areas are required to be addressed and remediated by 2012, per the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) M-093 series milestones (Ecology et al. 1998). The only ancillary facility associated with the site is the 116-B Reactor Exhaust Stack (subsequently referred to as reactor stack).

The 105-B Facility is located in the 100-B/C Area of the Hanford Site (Figure 1-1). The Hanford Site is located in southeastern Washington State and is operated by the U.S. Department of Energy (DOE). In November 1989, four areas of the Hanford Site were placed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List (NPL) under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The 100 Area NPL includes the 100-B/C Area, which is in various stages of the remediation process. Hazardous substances[2] in the 105-B Facility and reactor stack may present a potential threat to human health and the environment, and a cleanup action at these facilities is warranted to mitigate the threat. In accordance with previous commitments the DOE is continuing to seek a sponsor with interest in preserving all or part of the 105-B Facility for historical purposes. However, such a sponsor has not yet been identified, and this document assumes that there will be no long-term public use or structural preservation of the facility. Actions evaluated in this document would not be implemented for at least 3 years. This document is intended to present three potential cleanup action alternatives that may be included in an engineering evaluation/cost analysis (EE/CA) prepared at a later date. An EE/CA for a final removal action for the 105-B Facility will be prepared by the Tri-Parties (i.e., the EPA, Washington State Department of Ecology [Ecology], and DOE, Richland Operations Office) by September 30, 2005, per Tri-Party Agreement Milestone M-093-25. This document contains information that would support an evaluation in accordance with CERCLA and Title 40, *Code of Federal Regulations* (CFR), Section 300.415.

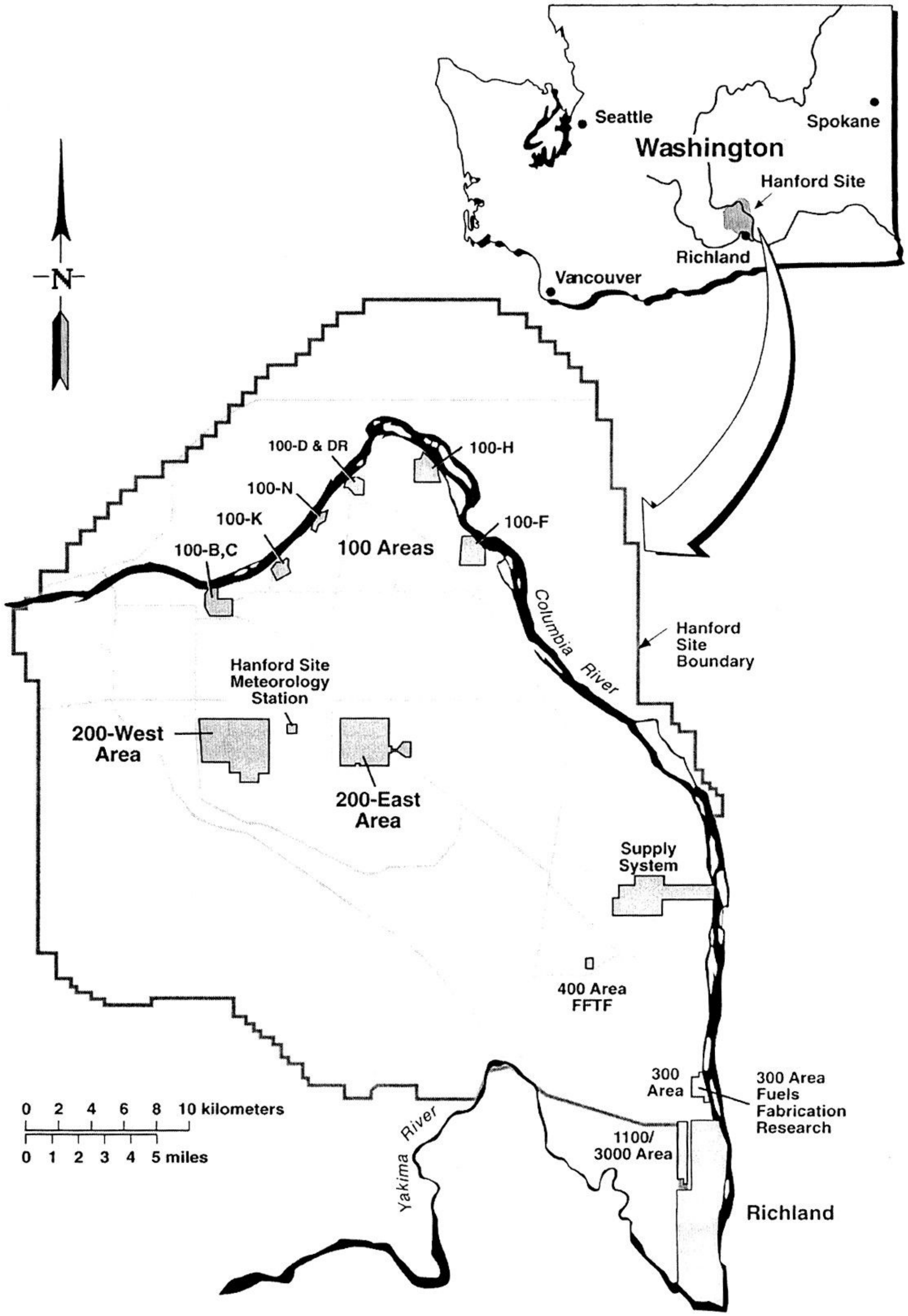
Consistent with the *National Environmental Policy Act of 1969* (NEPA), an EIS has been prepared on the disposition of the Hanford Site reactors (including the 105-B Facility but excluding the 100-N Reactor), which is documented in *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1992). The purpose of

[1] The term "Facility" is used in a generic way to encompass all the structures, buildings, tunnels, piping, ducting, etc., associated with the reactor building.
[2] "Hazardous substances" means those substances defined by Section 101(14) of CERCLA.

the EIS was to provide environmental information to assist DOE in selecting a decommissioning alternative for these eight surplus reactors at the Hanford Site. The EIS ROD (58 FR 48509) documented the DOE's selection of safe storage of these reactors followed by deferred one-piece removal of the reactor block and disposal at the Hanford Site's 200 West Area as the preferred decommissioning alternative. This document supports the EIS and ROD by providing a detailed evaluation of safe storage alternatives for the 105-B Facility.

This document describes the 105-B Facility, its historical significance, and interim action alternatives taken for preservation of historic materials. Additionally, site conditions and the sources and extent of contamination are presented to provide a framework for the discussion of cleanup action objectives and alternatives. Finally, each alternative is compared against a set of criteria for effectiveness, implementability, and cost. Although a previous Action Memorandum preserved the ability to mitigate hazards of the 105-B Facility to allow public access (DOE-RL 2001a), the alternatives evaluated in this document do not include this option. Under the alternatives evaluated in this document, options for long-term preservation of the structure and public access would no longer be viable.

Figure 1-1. Hanford Site Map.



2.0 SITE CHARACTERIZATION

2.1 BACKGROUND AND SITE DESCRIPTION

2.1.1 General Description of the 100-B/C Area of the Hanford Site

The 105-B Facility is located in the 100-B/C Area of the Hanford Site (see Figure 1-1) along the southern shore of the Columbia River in southeastern Washington State. The 100-B/C Area contains two inactive reactors facilities: the 105-B Reactor and the 105-C Reactor. The 105-C Reactor has undergone interim safe storage (ISS) and now exists in a safe storage enclosure (SSE) under the long-term surveillance and maintenance (S&M) program. The 105-B Facility is currently managed under the S&M program to ensure continued protection of human health and the environment during the safe storage period until decommissioning is initiated, as documented in the EIS (DOE 1992) and ROD (58 FR 48509). Guided public tours have occasionally been led through the 105-B Reactor along a maintained tour route. However, increased Hanford Site security has caused the cancellation of public tours since September 11, 2001. Support facilities for the 105-B and 105-C Reactors, with the exception of the 181-B River Pumphouse and the 182-B Reservoir and Pumphouse, have been demolished. The reactor exhaust stack for the 105-B Reactor remains standing in the reactor exclusion area adjacent to the 105-B Facility.

On November 3, 1989, the EPA placed the 100 Areas on the NPL because of soil and groundwater contamination resulting from the past operation of the reactors and their support facilities. The 100 Areas include many liquid and solid waste disposal sites used to support past reactor operations. To organize remediation efforts under CERCLA, these sites were subdivided into operable units consisting of waste sites that were related geographically to the reactor areas. The 100-B/C Area contains two source operable units (100-BC-1 and 100-BC-2) and one groundwater operable unit (100-BC-5). Remediation of waste sites in the 100-B/C Area has been initiated.

2.1.1.1 Land-Use and Access. Public access to the Hanford Site, including the 100-B/C Area, is currently restricted. Present land use in the 100 Areas consists of facilities support, waste management, and soil and groundwater remediation activities. The Columbia River, adjacent to the 100 Areas, is accessible to the public for recreational use (e.g., boating and sport fishing). Proposed alternatives for future land use were described in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) (DOE 1999). The ROD for that EIS identifies land use in the 100 Areas as conservation/preservation for the foreseeable future (64 FR 61615). The HCP EIS-designated land use for the 105-B Facility is high-intensity recreation to support visitor-service activities and facilities development.

On June 9, 2000, 792 km^2 (306 mi^2) of land surrounding an 82-km (51-mi)-long stretch of the Columbia River, known as the Hanford Reach, was designated a National Monument by Presidential Proclamation (65 FR 37253) under the *American Antiquities Act of 1906* (16 U.S.C. 431, et seq.). Portions of the 100 Areas of the Hanford Site up to 0.40 km (0.25 mi) inland from the high-water mark, including portions of the 100-B/C Area, are included in the Hanford Reach National Monument, pending cleanup and hazard mitigation. The 105-B Facility itself is outside the boundaries of the Monument, although the 181-B Pumphouse, located adjacent to the Columbia River, is within the Monument.

2.1.1.2 Flora and Fauna. The ecological setting of the Hanford Site is described in the *Hanford Site National Environmental Policy Act (NEPA) Characterization* (Neitzel 2001). The upland habitats affected by the actions described in this document are rabbitbrush/cheatgrass communities and highly disturbed industrialized areas covered with rocky soils and sparse, weedy vegetation dominated by cheatgrass and Russian thistle.

Before implementing any cleanup action alternatives, project-specific ecological resource reviews will be conducted to determine the presence or absence of species or habitats of concern. If ecological resources of concern are identified, mitigation actions will be prescribed to reduce or prevent injury. If injury to habitat or species of concern (as identified in the *Hanford Site Biological Resources Management Plan* [DOE-RL 2001b]) is unavoidable, compensatory mitigation for that habitat or species will be evaluated.

Currently, there are no threatened or endangered plants (50 CFR 17) listed by the federal government on the Hanford Site. However, nine species of plants listed as threatened or endangered by Washington State are found on the Hanford Site (Neitzel 2001). Washington State has also listed mature sagebrush habitat as "priority habitat" because of the decline of these areas due to agricultural development.

Four animal species listed by the federal government as threatened or endangered are associated with the Hanford Site. The threatened/endangered species include the bald eagle (threatened), the peregrine falcon (endangered), the steelhead trout (endangered), and the spring-run Chinook salmon (endangered). Consultation with the appropriate U.S. Department of Interior agency is required under the *Endangered Species Act of 1973* (16 U.S.C. 1531) to establish mitigation actions to prevent impact. This consultation for the bald eagle and the peregrine falcon is documented in the *Bald Eagle Site Management Plan for the Hanford Site, South-Central Washington* (DOE-RL 1994). A similar plan, the *Threatened and Endangered Species Management Plan, Salmon and Steelhead* (DOE-RL 2000b), has been developed for steelhead trout and Chinook salmon that defines pre-approved mitigation actions and determines when further consultation is required.

Under Washington State listings for threatened and endangered species, there are four additional animal species: the American white pelican, the ferruginous hawk, the Sandhill crane, and the western sage grouse. These species are not likely to be impacted by activities described in this document because of the distance of this project location from available habitat for these species. However, if any of these species are identified in a project-specific ecological review, mitigation actions will be implemented to prevent impacts.

2.2 HISTORICAL SIGNIFICANCE OF THE 105-B REACTOR

Groundbreaking for the 105-B Facility began in October 1943 (DOE-RL 2001a) by the U.S. Army Corps of Engineers as a part of the Manhattan Project effort to bring an end to World War II. In only 16 months the reactor was fully constructed and operational (BHI 2000b). The first indications of radioactivity were observed on September 26, 1944, with the reactor achieving full power on February 4, 1945.

The 105-B Facility was the world's first full-scale production reactor. The reactor produced plutonium fuel for the world's first nuclear device, detonated at the Trinity test site in Alamogordo, New Mexico, on July 16, 1945. The facility also produced the plutonium fuel used in the atomic bomb, named "Fat Man," detonated at Nagasaki, Japan, on August 8, 1945, which hastened the end of World War II 5 days later.

Final shutdown of the reactor occurred on February 12, 1968, and the 105-B Facility was declared excess property in the early 1980s. Support facilities for the 105-B Facility, with the exception of the 181-B River Pumphouse and the 182-B Reservoir and Pumphouse, were also demolished. The 116-B Reactor Exhaust Stack still stands adjacent to the 105-B Facility in the southwestern corner of the reactor area.

The historical significance of the 105-B Reactor has entitled it to numerous declarations, including National Historic Mechanical Engineering Landmark by the American Society of Mechanical Engineers in 1976, and the Nuclear Historic Landmark Award. Because of its historical significance, the 105-B Facility has been listed in the National Register of Historic Places and was designated a National Historic Civil Engineering Landmark in 1993. Since the late 1980s, guided tours have been led through portions of the 105-B Facility. Interpretive items and historical displays are exhibited in the facility along the current tour route.

In recognition of the need to preserve the physical legacy of the Manhattan Project, the DOE has declared in the "Record of Decision: Hanford Comprehensive Land Use Plan Environmental Impact Statement (HCP EIS)" (64 FR 61615) designated land use for the 105-B Facility as high-intensity recreation to support visitor-serving activities and facilities development.

Although the DOE has stated that the 105-B Facility will be preserved for an interim period of up to 10 years, the final configuration of the reactor, and thus the requirements for remediation under CERCLA, will be determined at a later date. At this time, this document assumes that there will be no long-term public use or preservation of the 105-B Facility beyond 10 years. However, if a sponsor for such use and preservation is identified, new documentation will be written accordingly.

2.3 105-B FACILITY INTERIM REMOVAL ACTION

In 2001, the *Engineering Evaluation/Cost Analysis for the 105-B Reactor Facility* (herein referred to as "interim removal action EE/CA") (DOE-RL 2001a) was prepared to analyze removal actions that may be performed at the 105-B Facility to protect human health and the environment.

However, that EE/CA differed from the previous reactor facility EE/CAs because it was constrained by DOE's decision to preserve the 105-B Facility for up to a 10-year interim period. None of the previous reactor facility removal actions included facilities under consideration for full or partial historical preservation of structure. Because of this, the selected removal action alternatives did not preclude use of any portion of the 105-B Facility for public access during the 10-year interim period (DOE-RL 2001a). The interim removal action recommended in the EE/CA and selected in the associated Action Memorandum was hazard mitigation for a 10-year interim period. The hazard mitigation alternative included the removal of hazardous substances from the 105-B Facility, while maintaining S&M activities such as routine radiological and hazard monitoring and safety inspections.

The interim removal action EE/CA analyzed removal action alternatives for up to a 10-year time period with the expectation that determinations to support the final removal action decision, or "final configuration," would be made by that time. Actions and associated costs for structural upgrades to allow sustained public access were to be identified during this interim time period to adequately assess the feasibility and cost of sustained public use and risks to human health and the environment from remaining hazardous substances. The 10-year time period is also consistent with the DOE's Columbia River Corridor Initiative, the goal of which is to complete many cleanup and access decisions by the year 2012 and restore the river corridor per the M-93 Tri-Party Agreement milestone series.

In addition to identifying and analyzing interim removal actions for the 105-B Facility, supplemental information was provided in the interim removal action EE/CA to help support decisions on the final configuration of the 105-B Facility. This information, as well as the actions and costs for mitigating hazards in all interior and exterior areas of the 105-B Facility to enable full public access for a 75-year period (coinciding with the timing for disposition of the reactor core as specified in the EIS ROD [58 FR 48509]), was presented in Appendix B, Tables B-1 and B-2 of the interim removal action EE/CA (DOE-RL 2001a).

This document does not consider long-term public use or structural preservation to be options for final configuration, but it also does not preclude these 10-year interim actions as described in the interim removal action EE/CA (DOE-RL 2001a) and selected in the Action Memorandum. The three options being considered in this document are consistent with those evaluated for the other reactors. Historic preservation requirements will be addressed for each of the cleanup action alternatives considered. Recordation and curation of artifacts will be the likely recommendations for achieving compliance with these requirements.

2.4 FACILITY DESCRIPTION

The 105-B Facility has been deactivated. Deactivation has included de-energization of nonessential electrical sources and equipment, preservation of tools and equipment, routine housekeeping, radiological surveys, and application of fixatives to many radiologically contaminated surfaces. The facility has not been fully decontaminated. Previous work has been performed to define the hazards to the public, workers, and the environment within the 105-B Facility. The *105-B Reactor Facility Museum Phase I Feasibility Study Report*

(Griffin et al. 1995), the *Hanford B Reactor Building Hazard Assessment Report* (Griffin and Sharpe 1999), and the interim removal action EE/CA (DOE-RL 2001a) document the current status of these hazards within the facility. Information regarding hazardous substances in the facility is based primarily on S&M survey data, knowledge of construction materials, historical operations, and process knowledge of the facility and of analogous facilities in the 100 Areas. Information on the nature and extent of contamination is provided in Section 2.5. Primary references for the facility information are *"Pre-Existing" Conditions Survey of the Hanford Site Facilities to be Managed by Bechtel Hanford, Inc.* (BHI 1994), *Summary of 100-B/C Reactor Operations and Resultant Wastes* (Gerber 1993), *Risk Management Study for the Retired Hanford Site Facilities* (WHC 1993), and *Hanford Surplus Facilities Hazards Identification Document* (BHI 1997b). Additional information was obtained from the work experience with the 105-C, 105-D, 105-DR, 105-H, and 105-F ISS and cleanup activities.

2.4.1 105-B Facility

The 105-B Facility (Figure 2-1) contains a reactor block, a control room, a spent fuel discharge area, a FSB, fans and ducts for ventilation and recirculating inert gas systems, water cooling systems, support offices, shops, and laboratories. The reactor facility is a steel reinforced concrete and concrete block structure. Within the reactor facility, massive reinforced concrete walls (0.9 to 1.5 m [3 to 5 ft] thick) extend upward to the height of the reactor block to provide shielding, with the upper sections constructed of concrete block (DOE-RL 2001a). Asbestos, radiological, and hazardous material contamination exists in the building.

Roof construction of the 105-B Facility is composed of precast concrete roof tile, except over the discharge area enclosure (the rear face) and the inner horizontal rod room. Over those areas, the roof is composed of 1.8-m (6-ft)-thick reinforced concrete (Gerber 1993). The original precast concrete tiles remain in place. Repairs have been made to individual precast roof panels that were showing signs of excessive deflection and corrosion (WHC 1994). The 105-B Facility underwent interim roof repair to replace flashing and mitigate drainage issues in fiscal year 2001. Total roof replacement is discussed in the *105-B Reactor Museum Feasibility Assessment (Phase II) Project* (BHI 2000a) and will be contingent on the determination of the final configuration of the overall reactor structure.

Until September 11, 2001, guided public tours were conducted on a tour route through a controlled portion of the building that has been deemed safe for supervised public entry. Entry requirements are imposed because hazardous substances were detected outside of the tour route during facility walkdowns and radiological surveys.

2.4.2 116-B Reactor Exhaust Stack

The 116-B Reactor Exhaust Stack is located adjacent to the southwestern corner of the 105-B Facility, in the 100-B/C Area of the Hanford Site, and has been designated the Waste Site Information Database (WIDS) code 132-B-2. The reactor stack is part of the 105-B Facility gas and exhaust air system. The stack has a concrete base with a diameter of approximately 4.9 m (16 ft) and a height of 61 m (200 ft). Associated with the site are an aboveground aluminum duct and an underground reinforced concrete duct. The site received low-level radionuclide contamination from the 105-B Facility (WHC 1994). The reactor stack is considered an ancillary facility and may pose chemical and radiological hazards.

2.4.3 Other Impacted Sites and Facilities

Three wooden sheds are present on the exterior of the 105-B Facility. The sheds are uncontaminated, are currently empty, and are addressed as part of the overall 105-B Facility.

Waste sites adjoining the reactor facility include 100-B/C pipeline remedial action project sites and the 120-B-1 Battery Acid Sump. The site of the former 132-B-4 Filter Building and facility process piping is also located near the reactor. Alternatives to remediate these waste sites were evaluated and approved in other CERCLA documents (EPA 1999). The selected remedy for both of the sites was to remove contaminated soil and structures, treat as appropriate, and dispose. No other waste sites or facilities are anticipated to be impacted by activities described in this document. However, additional waste sites (e.g., french drains, pipelines) may be discovered or encountered during a removal action. These sites will be recorded and mapped as necessary, and integrated with the Remedial Action and Waste Disposal Project during the removal actions to avoid the need for future reexcavation. Implementation of the selected removal action for the remediation of the waste sites will need to be coordinated between the respective programs.

2.5 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

Portions of the 105-B Facility and reactor stack are contaminated with chemical and radiological hazardous substances. To identify the hazardous substances in the facility, several sources of information were used, including results of S&M activities, characterization data, historical operations information, process knowledge, and knowledge of construction material. The primary hazardous substances of concern are radioactive materials. In addition, the 105-B Facility is expected to contain one or more of the hazardous materials known to be present in most Hanford Site facilities, including the following:

- Polychlorinated biphenyls (PCBs) in oils and light ballasts
- Lead paint
- Lead shielding
- Mercury switches, gauges, and thermometers
- Mercury or sodium vapor lights
- Used oil from motors and pumps
- Friable and nonfriable forms of asbestos
- Sodium dichromate from water treatment chemicals
- Cadmium from oxidation of reactor control rods.

Suspected contaminants in the 105-B Facility and reactor stack are summarized in Table 2-1. Key radionuclide contaminants are transuranics (TRUs), including plutonium-239 and americium-241, mixed fission products such as strontium-90 and cesium-137, and activation products such as carbon-14 and cobalt-60. Contaminants are most likely to be contacted as adherent films and residues encrusted in or on deactivated process equipment, piping, and ventilation system ductwork. In addition, the FSB and associated transfer pit contain radioactive residues and sediments emitting gamma radiation that, if unshielded, results in a direct exposure dose of 0.12 mrem/hr at the viewing window in the FSB viewing room.

2.6 RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY REMOVAL ACTION

The reactor facility and reactor stack addressed in this document are either known or suspected to be contaminated with radioactive and/or nonradioactive hazardous substances. Radionuclides are known to be carcinogenic. Potential radiation areas in the 105-B Facility include contamination areas in all below-grade areas, the top of the reactor, the inner and outer rod rooms, and working levels of the reactor. Potential airborne radioactivity areas would include the below-grade area FSB, gas tunnels, and the exhaust plenum. Below-grade portions of the FSB, transfer basin, sample rooms, and ball recovery systems are known to contain sources of high radiation or high contamination. The excess cancer risk associated with radionuclide contamination at the FSB and associated transfer pit could be as high as 7×10^{-4} for a person working full time in that area, which is beyond the accepted CERCLA cancer risk range of 10^{-6} to 10^{-4} (40 CFR 300).

The 105-B Facility is currently located in part of the 100-B/C Area radiologically controlled area, which means expected worker exposure would be less than 100 mrem/yr and only general employee radiological training (but no monitoring) is required to access the areas. A security fence encloses the 105-B Facility and reactor stack. Entrance into the fenced area requires approval from the site superintendent and additional site-specific training.

Entry requirements are imposed because of the hazardous substances detected during facility walkdowns and radiological surveys. A worker occupying the building full time (i.e., 40 hr/wk, 50 wk/yr) could receive an external exposure exceeding 100 mrem/yr. For example, the FSB and associated transfer pit contain radioactive residues and sediments emitting gamma radiation that results in a direct exposure dose of 0.12 mrem/hr at the viewing window in the FSB viewing room. Exposure at this rate for 2,000 hours in a normal work year would result in a cumulative annual dose of 240 mrem/yr and an excess cancer risk of approximately 7×10^{-4}. Although a level of exposure greater than 100 mrem/yr would be within allowable exposure levels for radiological workers, workers would require specific radiological worker training and monitoring to occupy the building full time in the present condition. The stated dose and level of risk would not be acceptable for general workers or a member of the public.

The primary pathway of concern for radionuclides is direct exposure. Inhalation and ingestion pathways are also of concern with the disturbance of piping, equipment, and building materials potentially containing radionuclides or hazardous substances, such as asbestos piping insulation or mercury switches. Current S&M activities reduce the potential for release of radioactive and hazardous substances, but exposure to personnel providing S&M for these buildings/facilities and to intruding wildlife (e.g., rodents, insects, snakes, and birds) may occur. There is also potential for the spread of contamination due to contact with, and subsequent transfer by, wildlife.

As the reactor building and reactor stack continue to age and deteriorate, the threat of potential release of hazardous substances increases, and it becomes more difficult to confine these hazardous substances from the environment. The S&M activities required to confine the hazardous substances over the long term may increase the risk of potential exposure to personnel. The potential personnel and wildlife exposure and the threat of future releases justify a cleanup action.

Figure 2-1. 105-B Facility and 116-B Reactor Exhaust Stack.

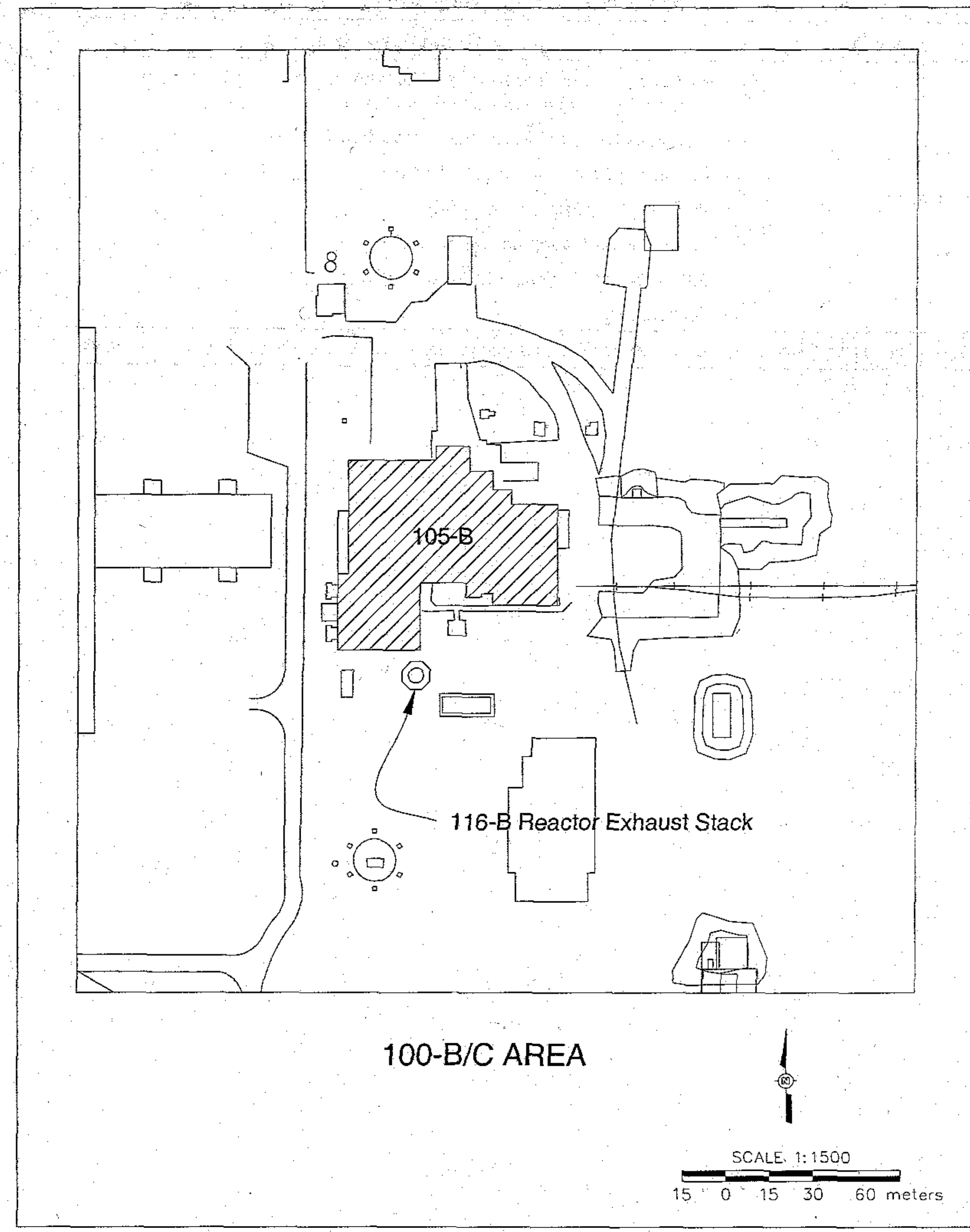


Table 2-1. Suspected Contaminants in the 105-B Facility and 116-B Reactor Exhaust Stack.

Facility	Hazardous Substance
105-B Facility	• Radioactive contaminants (e.g., strontium-90, cesium-137, carbon-14, cobalt-60, plutonium-239, americium-241) • Lead (shielding, oxides, switches, and drains) • Mercury (gauges, switches, and drains) • PCBs (light ballasts and gear oil) • Heavy metals (cadmium, chromium) • Asbestos (pipe lagging, insulation, and transite) • Oils/greases
116-B Reactor Exhaust Stack	• Low-level radioactive contaminants (carbon-14, tritium, cobalt-60, cesium-137)

3.0 CLEANUP ACTION OBJECTIVES

The primary purpose of this document is to evaluate the cleanup action alternatives for the 105-B Facility (except the reactor block) and the reactor stack (described in Section 2.4). The cleanup action would be conducted in a manner that is protective of human health and the environment. The principal threats to be addressed are radioactive and/or nonradioactive hazardous substances contained in and around the facility.

Based on the potential hazards identified in Sections 2.5 and 2.6, the specific cleanup action objectives are as follows:

- Reduce or eliminate the potential for exposure to hazardous substances above levels that are protective of the workers, public, and environment
- Reduce or eliminate the potential for a future release of contaminants
- Protect workers from the hazards posed by the aging facility
- Prevent potentially adverse impacts to cultural/natural resources and threatened or endangered species
- Safely manage (treat and/or store or dispose) the wastes generated by the eventual CERCLA removal action.

4.0 DISCUSSION OF CLEANUP ACTION ALTERNATIVES

The cleanup action alternative for the 105-B Facility and the reactor stack must be protective of human health and the environment. The principal threats to be addressed in the selection of a cleanup action alternative are radioactive and/or nonradioactive hazardous substances contained in and around the facilities and contaminated surfaces of the facilities. Decontamination of the reactor building has already occurred to the extent feasible through the removal of contaminated tools, equipment, and loose materials, and by applying fixatives to many contaminated surfaces. Uncontaminated structures (or portions of structures) associated with the facilities within this scope will be removed or otherwise addressed to facilitate implementation of the selected cleanup action. A final CERCLA removal action will be selected after all possible alternatives have been evaluated and documented in a CERCLA decision document by September 30, 2005, per Tri-Party Agreement Milestone M-093-25 (Ecology et al. 1998).

Based on the above considerations, the following three cleanup action alternatives were identified:

- Alternative One: No Action
- Alternative Two: Interim Safe Storage (ISS)
- Alternative Three: Long-Term Surveillance and Maintenance (S&M).

Common Requirements for Waste Management. The waste management requirements described in this section pertain to the selection and implementation of one of the evaluated cleanup action alternatives as a final CERCLA removal action. A final CERCLA removal action will be selected after all possible alternatives have been evaluated and documented in an EE/CA or other CERCLA decision document by September 30, 2005m per Tri-Party Agreement Milestone M-093-25 (Ecology et al. 1998).

Cleanup action Alternatives Two and Three would each result in the generation of waste that would require disposal at an appropriate disposal site, should they be implemented as final removal actions under CERCLA. Waste management would be a common element for these alternatives. Each alternative would evaluate recycling, when economically feasible, for releasable material to reduce the volume of material disposed. Releasable material would not be subject to CERCLA authority, including CERCLA offsite acceptability determinations, but instead must comply with all applicable provisions of the *Resource Conservation and Recovery Act of 1976* (RCRA) or other laws. Inert uncontaminated and decontaminated rubble and other miscellaneous structural material that could not be recycled may be used to fill void spaces in the below-grade structures following demolition. Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed). Most of the contaminated waste generated during implementation of these alternatives would be disposed to the Environmental Restoration Disposal Facility (ERDF) in the Hanford Site's 200 West Area. Based on previous evaluations, such as the EE/CA addressing facilities in the 100-DR and 100-F Areas (DOE-RL 1998a), the ERDF would be the preferred waste disposal option because it is an engineered facility that provides a high degree of protection to human health and the environment and is more cost effective than disposing waste at other disposal sites. Construction and operation of the ERDF were authorized via a separate CERCLA ROD (EPA 1995) and explanation of significant difference (ESD) (Ecology et al. 1996). The ERDF is a highly engineered structure designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and final cover.

The *U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences (ESD)* (Ecology et al. 1996) modified the ERDF ROD (EPA 1995) to clarify the eligibility of waste generated during cleanup of the Hanford Site. The ESD makes eligible for ERDF disposal any low-level waste, mixed waste, and hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., decontamination and demolition [D&D] wastes, RCRA past-practice wastes, and investigation-derived waste), provided that the waste meets ERDF waste acceptance criteria and that appropriate CERCLA decision documents are in place.

The waste generated during the final selected CERCLA removal action would fall within the definition of waste eligible for disposal at the ERDF established in the ERDF ROD and subsequent ESD. Waste may require treatment to meet ERDF waste acceptance criteria. The type of treatment and the location where treatment would be accomplished would be predetermined by DOE, EPA, and Ecology on a case-by-case basis. Waste volumes that would be generated for disposal at the ERDF are not expected to significantly impact capacity limitations at the ERDF. The waste volumes in this document have been taken into account for ERDF planning purposes. Further discussions of the construction and operation of the ERDF are not within the scope of this document.

While most of the waste generated during the final selected CERCLA removal action would likely meet the ERDF waste acceptance criteria, some waste may not meet ERDF waste acceptance criteria or may not be able to be treated to meet the ERDF waste acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid wastes and TRU wastes that may be encountered or generated during the final selected CERCLA removal action. Collected liquids containing levels of radioactive and/or nonradioactive hazardous substances meeting waste acceptance standards would be sent to the Hanford Site's Effluent Treatment Facility (ETF) and treated to satisfy applicable or relevant and appropriate requirements (ARARs) for discharge. Clean water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

The ETF, the Central Waste Complex (CWC), the ERDF, and the 100 Area NPL site are considered to be a single site for the purposes of disposal of waste from cleanup actions proposed in this document. There is no requirement to obtain a permit to dispose of CERCLA wastes at these facilities.[1] The ETF and CWC facilities have been permitted for management of non-CERCLA wastes. In these situations, any permit conditions would need to be complied with for management of CERCLA wastes as well. It is expected that the waste generated during cleanup actions proposed in this document can be disposed on site. However, if any waste is encountered that must be sent off site, EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed disposal site for receiving CERCLA removal action waste.

Uncontaminated material would be disposed to any Subtitle D landfill and recycling would be considered, as appropriate.

Common Requirement for End States. Alternatives Two and Three would each result in an end state (i.e., final disposition) that would involve D&D of the reactor stack by 2012 and allow eventual disposal of the 105-B Reactor block to the 200 Area Plateau. As stated in the EIS ROD (58 FR 48509), the final proposed action for disposal of the reactor block would include the transport of the reactor block, intact, on a tractor transporter, from its present location in the 100 Areas to the 200 Area Plateau for disposal.

For Alternative Two, planning activities to prepare the reactor block for transportation and disposal would occur during the latter stages of the S&M of the SSE. For Alternative Three, planning activities to prepare the reactor block for transportation and disposal would occur as part of the reactor facility D&D planning activities, prior to the D&D of the reactor facility, within 66 years per the EIS ROD (58 FR 48509). The actual transport and disposal would occur within 66 years for both alternatives. The costs associated with this common end state are not included in the current cost estimates for either alternative.

4.1 ALTERNATIVE ONE – NO ACTION

The No Action alternative is included as a baseline to determine the appropriateness of conducting a cleanup action. With the No Action alternative, no D&D or ISS activities would be performed, and current S&M activities would be discontinued. Public access to the facility would not be permitted under this alternative. Hanford Site institutional controls (e.g., fencing, posted signs) would be left in place but not maintained to help minimize personnel, worker, and public entry to the facilities. No other specific controls would be established for the facilities covered by this document. Because the facilities would not be decontaminated and no action

[1] CERCLA Section 104(d)(4) states that, where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purpose of this section. The preamble to the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another, and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the 100 Area NPL site and the ERDF, ETF, Low-Level Burial Ground, and CWC are considered to be a single site for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for those facilities and waste contaminated with hazardous substances. Materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances will be dispositioned by DOE.

would be taken to stop the facilities from deteriorating, there would be an increased threat and likelihood that a release would occur, potentially exposing the workers, public, or environment to hazardous substances.

4.2 ALTERNATIVE TWO – INTERIM SAFE STORAGE

Alternative Two would consist of D&D of the 105-B Facility and the reactor stack, implementing ISS for the 105-B Facility, and associated waste disposal. Also included in this alternative is the construction of an SSE over the reactor block that would prevent advanced structural deterioration and potential release of radionuclides or other hazardous substances, followed by long-term S&M of the 105-B Facility until removal and disposal of the reactor block. The goal of ISS is to ensure that the SSE structure provides durable, long-term storage and safe access for interim inspections for the duration of the ISS period, which may be up to 66 years, during which the 105-B Reactor block would be prepared for transportation and transported to the 200 Area Plateau for disposal. The ISS alternative would not involve public access to the facility, and facility tours would therefore not be conducted. The alternative would involve several stages and would be implemented as described in the following subsections.

4.2.1 Decontamination and Demolition

The D&D portion of this alternative would consist of assessment, decontamination, and demolition (the waste disposal component is discussed in Section 4.0) of the reactor stack and portions of the reactor facility support areas, including the FSB, that are located outside of the reinforced shield walls surrounding the reactor block (Figure 4-1).

Assessment would consist of radiological surveys and sampling, characterization, and preparation of all engineering and safety documents and work packages to perform the field work.

Decontamination of the reactor stack would be required to prepare the facility for demolition. Decontamination of reactor support areas would be required to prepare the reactor building for ISS. Decontamination could be accomplished through a variety of methods such as scabbling or scaling. In general, when physical removal of contaminants is not feasible or cost effective, the contamination would be "fixed" so that the contaminants would remain attached to the construction materials and would be less likely to be disturbed during subsequent demolition activities. Methods of fixing contaminants in place include painting, applying asphalt, and spreading plastic sheeting. Specific to preparation for the ISS, loose contamination would be removed or fixed to the greatest extent feasible in accessible areas within the shield walls. Decontamination would be performed to the extent feasible and would satisfy one or more of the following needs:

- **Worker safety:** Surface decontamination would minimize worker exposure to contaminants during demolition.

- **Air emissions:** Decontamination would ensure that fugitive emissions do not exceed applicable air standards during demolition or that best available control technologies would be used.

- **Waste minimization:** Decontamination of surfaces would result in substantially reduced contaminated waste volumes.

- **Cost effectiveness:** Decontamination/stabilization before demolition would reduce the level of protection required during demolition and would reduce contaminated waste volumes, thus reducing overall removal and disposal costs.

Demolition would apply to the reactor stack and portions of 105-B Facility and may be preceded by dismantling facility components, such as severing and removing ductwork or selectively removing a facility wall or structure. Demolition generally means large-scale facility destruction using heavy equipment (e.g., wrecking ball, excavator with a hoe-ram, shears, and concrete pulverizer), explosives, or other industrial methods. Demolition of the reactor stack would consist of removing the above-grade structure. In some cases, it would also involve removing portions of the below-grade structures and underlying soil, as described in Section 4.2.3. The first phase of demolition at the 105-B Facility would involve removing the reactor support areas and any associated foundations outside the reactor shield walls, whether at grade or subsurface. Below-grade structures would be removed to a minimum of 0.9 m below surrounding grade. If the structures below 0.9 m meet cleanup requirements as described in Section 4.2.3, the remaining structure will be left in place. Otherwise, removal would continue as described in Section 4.2.3. The second phase of reactor demolition would involve removing selected equipment, materials, and structural components from inside the reactor shield walls to prepare for the SSE, as described in Section 4.2.2.

Demolition methods would be selected based on the structural elements to be demolished, remaining radionuclide contamination, location, and integrity of the reactor shield walls. Any fixed contamination on sections of the structure to be demolished would be separated and disposed. Dust-suppression techniques would be employed during demolition activities.

4.2.2 Construction of the Safe Storage Enclosure

The existing reactor shield walls, constructed of reinforced concrete 0.9 to 1.5 m thick, would be used as the primary enclosure for safe storage. Upon removal of the applicable components from inside the SSE and D&D of the reactor support areas surrounding the shield wall, a roof would be constructed (as required) to enclose the top of the reactor block and adjacent rooms. The roof would consist of structural steel and metal roof decking. The shield walls would support the roof. Openings between the new roof and top of the shield walls would be closed with wall panel siding similar to that of the new roof. Openings and penetrations within the shield walls would be closed: large openings would be sealed by concrete pourbacks, and smaller openings and penetrations would be closed by welded caps, foam sealant, or fire plugs (steel plates bolted in place), as appropriate. Figures 4-1 through 4-4 provide the layout of the SSE for the 105-B Facility.

A single-door entry into the SSE would be provided to limit and control access and would be welded shut. Necessary ventilation ducting would be installed inside the SSE that would be connected to an external portable exhaust unit prior to entry for maintenance activities. A remote monitoring system would be installed inside the reactor enclosure so that key parameters could be monitored between S&M entries. The final configuration of the building would feature the existing shield walls as the exterior of the building, a single-entry door that would be used for inspections, and a metal roof with siding that matches the roof installation. The equipment associated with the monitoring and electrical power and lighting would be installed in a utility room located outside of the SSE so that entry into the SSE would not be necessary to service this equipment.

The remaining reactor block would receive a new roof or roof enhancements, lighting, and power systems. A remote monitoring system would be installed inside of the reactor enclosure. The final configuration of the building would feature the existing shield walls as the exterior of the building, a single-entry door that would be used for inspections, and a metal roof with siding that matches the roof installation.

4.2.3 Residual Contamination

The degree to which subsurface structures and any contaminated soil would be addressed during D&D would depend on a number of factors including proximity to other waste sites. As described in Section 2.4.3, the 105-B Facility and reactor stack are adjacent to waste sites for which remediation is planned or under way. In these cases, the subsurface structures and soil would be addressed in coordination with those waste sites using the applicable ROD and cleanup standards for those sites.

If no coordination with adjacent waste sites is required, one of two options would be implemented. If feasible, subsurface structures and contaminated soil would be characterized and evaluated at the time of D&D in accordance with the remedial action objectives and cleanup standards specified in the appropriate 100 Area ROD. This would involve sampling any subsurface structural materials to determine if the materials meet the cleanup standards for protection of human exposure via direct contact, and protection of groundwater and the Columbia River. If any soil contamination is known or suspected, the soil underlying the site would also be characterized and evaluated against cleanup standards specified in the appropriate ROD.

The RESidual RADioactivity (RESRAD) computer code dose models for buildings (RESRAD-BUILD [ANL 1994]) and soils (RESRAD-SOIL [ANL 1993]) would be used to determine whether structural materials or soils exceed the radionuclide cleanup standards. Verification of groundwater and river protection would also be accomplished by applying RESRAD dose models. If the below-grade structures meet the cleanup standards specified in the appropriate 100 Area ROD, the remaining structures would be left in place. If the below-grade structures do not meet the risk level, or process knowledge indicates that an area will likely not meet the specified cleanup levels, excavation would continue until the cleanup standards are achieved. Structural materials or soil that exceed cleanup criteria would be removed and disposed at the ERDF.

If it is not feasible to remediate below-grade structures and soil at the time of D&D, the site would be identified as a discovery site in the Hanford Site waste site database. Disposition of these sites would then be deferred to the Remedial Action and Waste Disposal Project, where they would be remediated in accordance with the appropriate 100 Area ROD.

For the 105-B FSB structure and below-grade portions of the 116-B Reactor Exhaust Stack, it is anticipated that subsurface structures and any underlying soil would be addressed as part of D&D in accordance with the evaluation process described previously. The 105-B FSB was drained and cleaned of debris. Some residual sediment from the FSB remains in two transfer pits. This sediment would be removed in a manner similar to removal of sediment in the transfer pit at the 105-C Reactor (BHI 1997a). The sediment will be grouted in place and cut into large blocks (monoliths) to be removed and disposed at the ERDF.

The FSB structure and below-grade portions of the reactor stack would be sampled and characterized, as would the underlying soil. If the below-grade structures are determined not to exceed cleanup standards specified in the appropriate 100 Area ROD, they may be backfilled with uncontaminated debris. The bottom of the 105-B FSB structure is approximately 13.2 m above the groundwater table. Because only inert or decontaminated material would be disposed in the below-grade structures, any infiltration that might occur would not result in the discharge of any hazardous substances to the groundwater. The effect of an accumulation of rainwater from the remaining subsurface structure will be taken into consideration when determining if the structure meets cleanup standards. If structures or underlying soil exceed cleanup standards, they would be removed as appropriate. Upon completing D&D activities, a minimum 1.0 m of clean fill/soil cover would be placed over any remaining below-grade structures and inert/demolition material and would be graded to meet the surrounding terrain in such a manner that would minimize infiltration of runoff from precipitation.

4.2.4 Long-Term Surveillance and Maintenance of the Safe Storage Enclosure

Long-term S&M would be required only for the 105-B Facility, because the reactor stack would be demolished and removed. S&M activities associated with the SSE would be assumed to occur until final disposition of the reactor block, which is within 66 years, as defined by the EIS ROD (58 FR 48509). By design, the SSE structure would require minimal surveillance. It would be equipped with remote monitoring equipment and would require physical entry only once every 5 years. The design of the SSE structure would be such that no significant maintenance would be required.

4.2.5 Cost Estimates for Alternative Two

The detailed cost estimates for Alternative Two are provided in Table 4-1. The present-worth (discounted) cost for Alternative Two is approximately $18,408,000.

Cleanup actions often incur costs at different times. For example, construction costs may occur at the beginning of a cleanup project followed by periodic costs occurring in subsequent years or decades to maintain the effectiveness of the remedy. Because of the time-dependent value of money, expenditures occurring in the future are not considered directly equivalent to expenditures occurring at the present time. The present-worth cost method depicts the amount of money required to be set aside at the initial point in time (e.g., in the current year) to fund all cleanup activities occurring over the life of the alternative. Present-worth analysis assumes that the funding set aside at the initial point in time increases in value as time goes on, similar to how money placed in a savings account gains in value due to interest paid on the account. Although the federal government does not typically set aside the money in this manner, the present-worth analysis is specified under CERCLA as the approach for establishing a common baseline to evaluate and compare alternatives that have costs occurring at different time frames. While the money may not actually be set aside, the present worth costs are considered directly comparable for evaluating alternative costs.

Example:

> Assume that a cleanup alternative would incur a $20,000 cost 20 years in the future. Using a 2.9% discount rate (see note below), $11,290 would need to be set aside in the current year to have $20,000 available in 20 years (i.e., the present-worth cost of this alternative is $11,290). In contrast, only $4,789 would need to be set aside in the current year to fund a $20,000 action occurring 50 years in the future. (Note: The discount rates [interest rates] for evaluating government programs are established by the Office of Management and Budget and are updated on a periodic basis to reflect the most recent economic predictions.)

Consistent with guidance established by the U.S. Office of Management and Budget, present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB 1992). For purposes of this evaluation, present-worth (discounted) cost values were calculated using a discount rate of 3.9% (BHI 2002, OMB 1992).

In contrast with the present-worth costs, the total nondiscounted costs do not take into account the value of money over time. The nondiscounted cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or "discounting") to reflect current year or "set aside" cost based on an assumed interest rate. Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for remedy selection purposes.

Example:

> Assume that a cleanup alternative would incur costs of $10,000 per year over a 50-year time frame, with an additional $20,000 cost occurring 25 years into the process. The total nondiscounted cost for this alternative is $520,000 ([$10,000 x 50 years] + $20,000). Using a 2.9% discount rate, the present-worth cost of this same alternative is $272,102.

The total nondiscounted cost for Alternative Two is approximately $18,878,000. As stated previously, present-worth costs are used for evaluation of alternatives in the CERCLA process. The total nondiscounted costs are presented here for information purposes.

The detailed cost estimates to implement this alternative were developed using the following methods:

- The estimated costs for the ISS of the reactor facility were based, in part, on the actual costs incurred to date for ISS of the 105-C, 105-D, 105-DR, 105-F, and 105-H Facilities, which entailed similar activities and waste volumes as those proposed for the 105-B Facility. Cost estimates are based on 2000 costs from Table 4-1 of the *Engineering Evaluation/Cost Analysis for the 105-D Reactor Facility and Ancillary Facility* (DOE-RL 2000a), which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).

- The estimated costs for the FSB transfer pit sediment removal used actual costs from sediment removal from 105-C Reactor FSB transfer pits in 1997. The 1997 costs listed on page 31 of the *105-C Reactor Interim Safe Storage Project Final Report* (BHI 1997a) were converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).

- The estimated costs for the D&D of the 116-B Reactor Exhaust Stack were based on costs for similar activities at the 105-D and 105-DR Facilities (DOE-RL 1998a), which were converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).

Because most expenditures associated with Alternative Two would occur up front (i.e., during the baseline year), there is little relative difference in the discounted present-worth and nondiscounted costs.

The cost associated with the preparation for transportation, transport, and disposal of the 105-B Reactor block to the 200 Area Plateau within the 66-year ISS period is not included in the current estimate or the scope of this document.

4.3 ALTERNATIVE THREE – LONG-TERM SURVEILLANCE AND MAINTENANCE

Alternative Three would consist of long-term S&M of the reactor stack and the 105-B Facility, followed by D&D within 66 years of the S&M phase and the transport and disposal of the 105-B Reactor block to the 200 Area Plateau. In accordance with Tri-Party Agreement milestone series M-093, S&M would be conducted for the reactor stack for up to 10 years (i.e., 2012), by which time D&D of this structure must be completed. The reactor stack would be demolished and residual subsurface contamination would be managed as described for Alternative Two (Section 4.2.3). The 105-B Facility, however, would be in an S&M program for up to 66 years, during which D&D would be implemented. Implementation of the S&M alternative would not include public access to the facility, and facility tours would not be conducted. The D&D phase of this alternative would be the same as described in Alternative Two (Section 4.2.1), not including preparation for ISS. Following D&D, the 105-B Facility would be left in a condition to immediately implement final disposition of the reactor block to the 200 Area Plateau in accordance with prior decisions made under NEPA. An SSE structure would not be constructed under this alternative.

The S&M measures would include routine radiological and hazard monitoring of the facilities, safety inspections, and periodic confirmatory measurements of ventilation systems, as required. The S&M activities would be tailored to the specific condition of each facility. Activities would be balanced to reduce hazards to workers while reducing the potential for releases of contaminants. Major repairs such as reroofing and shoring structural components would be necessary for the 105-B Facility during the S&M period. These major repairs would be required to ensure the integrity of the facility, which is necessary to contain contaminants within the structure. It is anticipated that new roofs would be required for the reactor building three times during the S&M period, as the roofs typically have a 20-year life. Other major repairs would be performed at the reactor facility and reactor stack during their corresponding S&M periods on an as-needed basis.

As facilities age and deteriorate, typically S&M must become more aggressive and would involve increased frequency of required activities and a higher level of worker protection, which would increase cost. As cost increases, long-term S&M would become less viable. Uncertainties regarding the actual rate and nature of facility deterioration makes estimation of cost in future years difficult with any degree of reliability. As the facilities continue to age and S&M is necessarily more aggressive, it may not be cost effective to prolong the S&M period for the 105-D Facility for the full 66 years. D&D of the reactor facility may be required sooner to ensure that releases would not occur. Without an increasingly aggressive S&M program, the threats associated with unplanned releases to the environment would increase. Conversely, an aggressive S&M program would require workers to enter facilities more often, and workers may be required to perform more invasive procedures to maintain the facilities, which would increase the potential for exposure to workers. Additionally, personal protection requirements to maintain the more aggressive program would continually increase, adding to the cost.

A variety of waste streams would be generated in the performance of S&M that would be characterized, packaged, and disposed. Waste that meets the ERDF waste acceptance criteria would be disposed at the ERDF, and other wastes would be managed to comply with identified ARARs.

4.3.1 Cost Estimates for Alternative Three

Costs are presented in terms of total nondiscounted costs and present-worth costs. The present-worth (discounted) cost for Alternative Three is approximately $4,214,000. The total nondiscounted cost is a summation of the capital and operation and maintenance costs for the duration of the project and reflects potential long-term costs that have not been discounted to reflect cost in 2002 dollars (present worth). As explained in more detail in Section 4.2.5, present-worth analysis is a standard methodology endorsed by the U.S. Office of Management and Budget that allows for a cost comparison of different remedial alternatives where costs are incurred in different time periods, on the basis of a single cost figure for each alternative (OMB 1992). This single figure, or present worth (presented in Table 4-2), is the amount needed to be set aside at the start of the remedial action to ensure that funds will be available in the future as they are needed. Present-worth (discounted) cost values were calculated using a discount rate of 3.9% (BHI 2002, OMB 1992).

The total nondiscounted cost for Alternative Three is approximately $24,213,000. Nondiscounted cost estimates for long-term S&M at the 105-B Facility are based on 2000 costs from Table 4-2 of the interim removal action EE/CA (DOE-RL 2001a), which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992). Nondiscounted cost estimates for S&M at the 116-B Reactor Exhaust Stack are based on 1998 costs from the fiscal year 1999 multi-year work plan (DOE-RL 1998c), which were converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992). The nondiscounted and present-worth costs were then summarized for the 10-year S&M period for the reactor stack and up to a 66-year period for the 105-B Facility (Table 4-2). Costs have not been factored into the estimate to account for the increased demands on the S&M program that would be required over time, nor have costs associated with increased worker protection measures been included. Aside from the estimates for roof replacement and associated waste disposal costs that would be required on the reactor every 20 years, costs associated with other potential major repairs have not been included in the estimate because of the unknown frequency and magnitude of the required repairs. As a consequence, the reliability of cost estimates for this alternative is highly uncertain. Final disposition would be required during the 10-year and 66-year S&M periods for the reactor stack and the reactor facility, respectively. The cost of D&D of the 105-B Facility and reactor stack (presented in Section 4.2) is included in this alternative. The D&D cost is quoted in present-worth terms and assumes that D&D would occur within the S&M period for the respective facilities.

Because up front expenditures associated with Alternative Three would be low and expenditure would increase with time, there is a large difference in the discounted present-worth and nondiscounted costs.

The cost of preparation for transportation, transport, and disposal of the 105-B Reactor block to the 200 West Area is not included in the estimate.

Figure 4-1. 105-B Facility Identifying the Safe Storage Enclosure Area.

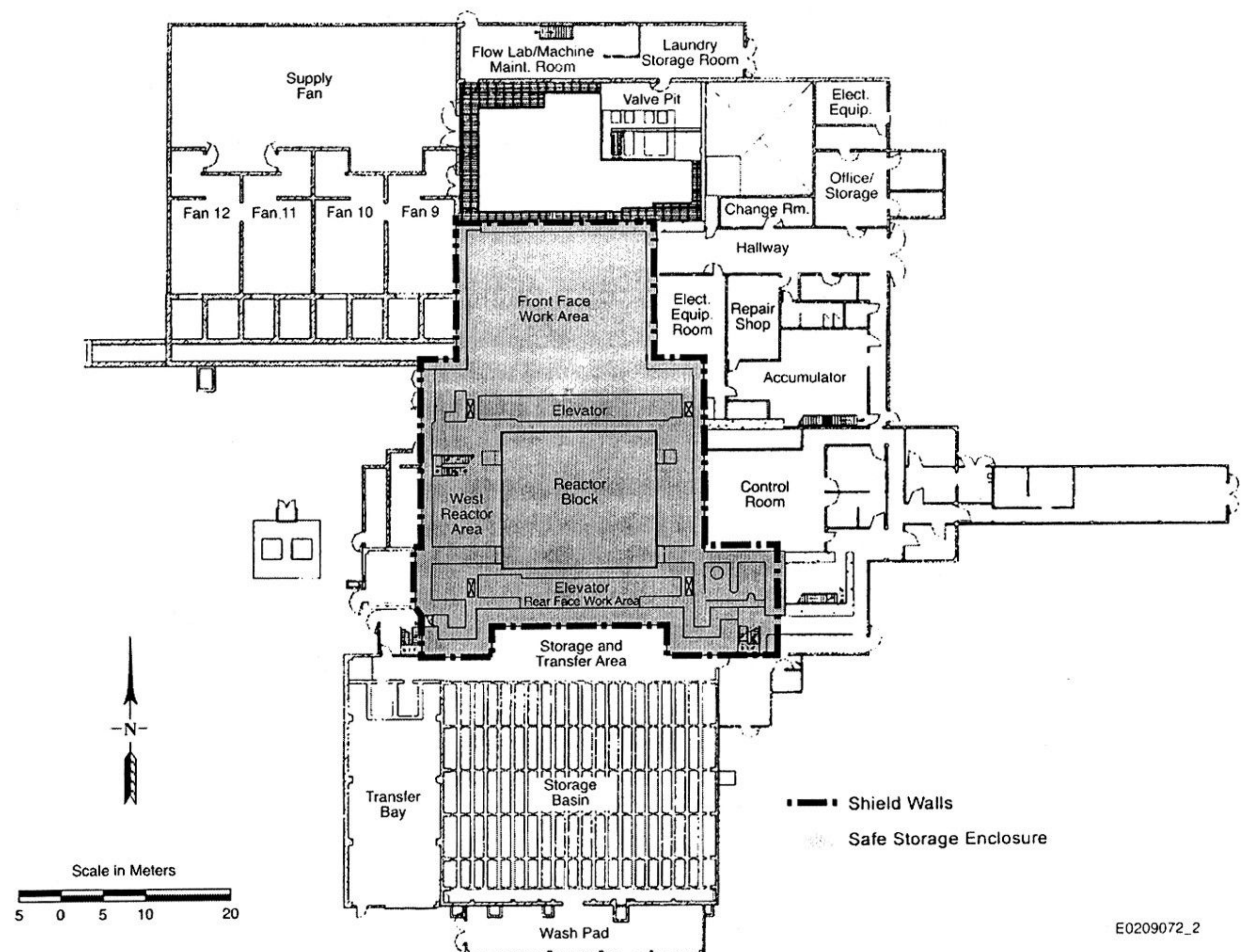


Figure 4-2. Safe Storage Preparation.

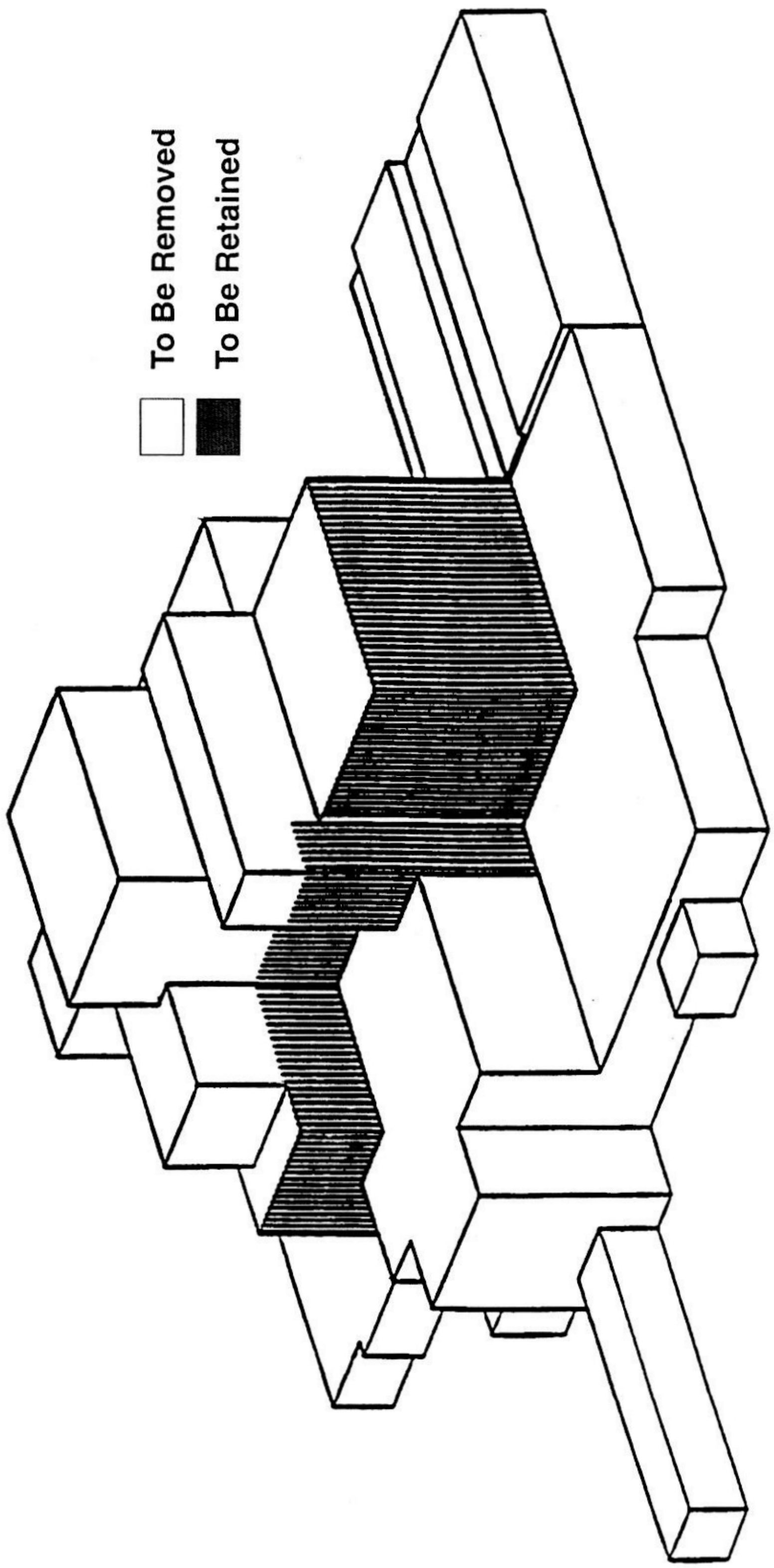


Figure 4-3. Isometric View of a Safe Storage Enclosure.

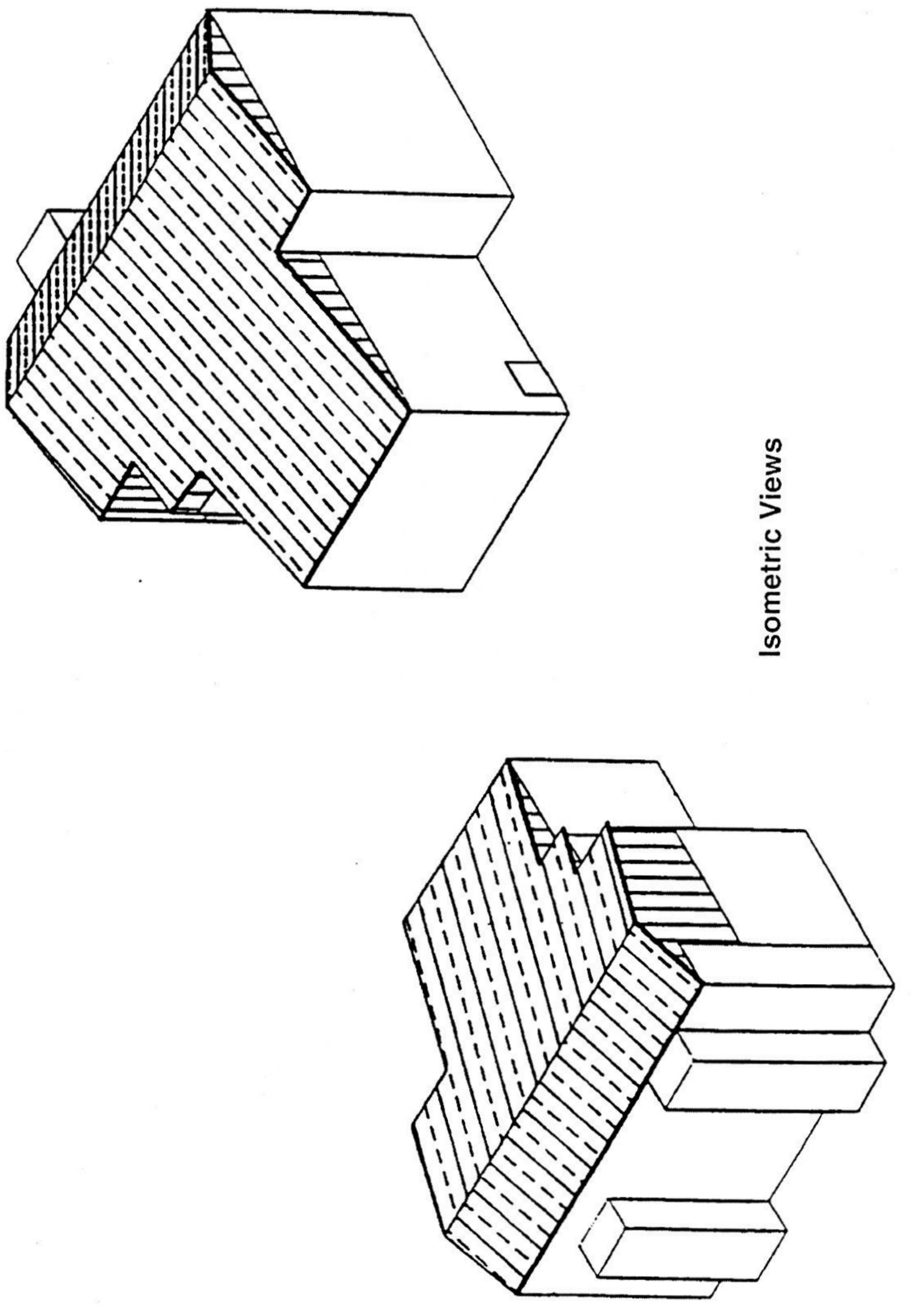


Figure 4-4. Aerial View of the Safe Storage Enclosure (Before and After).

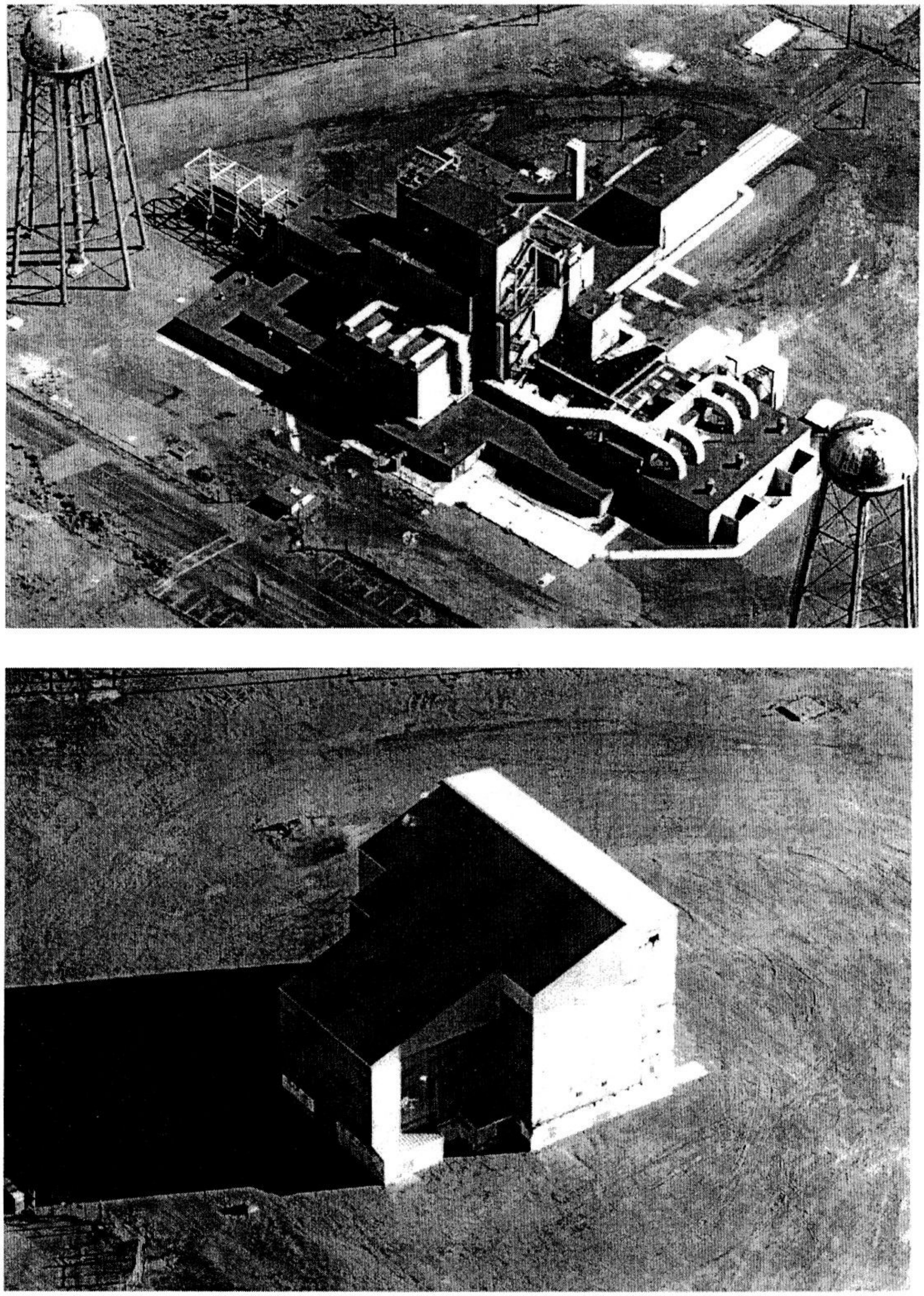


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Table 4-1. Nondiscounted and Present-Worth Cost Estimates for Alternative Two – Interim Safe Storage.[a]

Facility	Estimated Cost ($)
105-B Facility	
Sampling and analysis[b]	365,000
Engineering[c]	208,000
Demolition and construction of the SSE[d]	12,016,000
Equipment/materials[e]	1,449,000
Waste disposal[f,g] = 5,106 m^3	731,000
Basin structure removal to 4.6 m below surrounding grade[h]	
D&D	1,244,000
Waste disposal[g,f] = 1,843 m^3	264,000
FSB transfer pit sediment removal[i]	12,000
D&D Subtotal	**$16,289,000**
Post-construction S&M[j]	712,000
Facility Total	**$17,001,000**
116-B Reactor Exhaust Stack[k]	
D&D	1,722,000
Low-level waste disposal (approximately 1,337 m^3)	154,000
Asbestos-containing waste disposal (approximately 35 m^3)	1,000
Subtotal	**$1,876,000**
Nondiscounted Grand Total	**$18,878,000**
Present-Worth (Discounted)	**$18,408,000**

Table 4-1. Nondiscounted and Present-Worth Cost Estimates for Alternative Two – Interim Safe Storage.[a]

Facility	Estimated Cost ($)

[a]The cost estimate for D&D of the 105-B Facility does not include costs required for preparation for transport and disposal of the 105-B Reactor block. The costs given are based on Calculation Brief No. 0100B-CA-C0017 (BHI 2002).
[b]Sampling and analysis: Costs associated with sample planning (e.g., data quality objectives and characterization plan), preparation, collection, and analysis. This activity provides pre-engineering information to assist in D&D planning and waste disposition planning. Cost estimates are based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[c]Engineering: Costs associated with all up-front engineering. Activity to include documentation associated with CERCLA planning, EE/CA, hazard classification, removal action work plan, etc. The cost estimate is based on the cost estimates from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[d]Construction: Costs associated with the actual demolition and safe storage of the reactor. This activity includes the demolition and the subcontract and other field support activities, as well as continued engineering in support of the safe storage. The cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[e]Equipment and materials: Costs associated with the procurement of materials and the rental/lease of heavy equipment. Activity will cover all costs of equipment and materials starting from the pre-engineering walkdowns through the final site restoration activities. The cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[f]Waste disposal volume estimates were derived from actual waste volume shipments from ISS of the 105-C Reactor. The waste volumes do not distinguish between waste type (e.g., low-level or mixed) because it is assumed that all of the waste will meet the ERDF waste acceptance criteria. The cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[g]Disposal cost assumptions: Disposal of low-level radioactive, dangerous, and mixed wastes at the ERDF at \$137.33/m^3 (\$105/yd^3) (2000 cost). This includes all direct and indirect costs and cost of transportation from the area to ERDF. Cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[h]Removal of complete basin structure additional waste would increase the cost by \$581,920 (2000 cost). The cost estimate is based on the cost estimates from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[i]The cost based on sediment removal from the 105-C Reactor FSB transfer pits in 1997, so the 1997 cost listed on page 31 of BHI (1997a) was converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[j]S&M assumptions (2002 cost broken into S&M costs):

80 hr/yr x \$40/hr x 66 yr	= \$ 211,200
Based on FY 2002 5-Year Historical Costs	= \$ 501,191
for a total of (2002 cost)	\$ 712,391

The cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-1, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[k]Disposal cost assumptions: Disposal of low-level radioactive, dangerous, and mixed wastes at the ERDF at \$103/m^3 (\$78.50/yd^3) (1998 cost). This includes all direct and indirect costs and cost of transportation from the area to ERDF. ACM assumed to be noncontaminated and is to be disposed at the ERDF at \$13/m^3 (\$10/yd^3) (1998 cost). The cost estimate is based on 1998 costs from DOE-RL (1998a), Table 4-2, 116-DR Exhaust Air Stack, which were converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
ACM = asbestos-containing material

Table 4-2. Nondiscounted and Present-Worth Cost Estimates for Alternative Three – Long-Term Surveillance and Maintenance.[a]

Facility	Estimated Annual Cost ($)	Estimated Cost ($) for Life Span
Surveillance and Maintenance		
105-B Facility[b]	104,000	6,880,000
116-B Reactor Exhaust Stack[c]	8,000	85,000
Subtotal	**$112,000**	**$6,965,000**
Roof Replacement on Reactor Building[d]		
One time each 20 years	412,000	--
Roof waste disposal = 1,053 m^3	151,000	--
One time every 20 years (sum of replacement and disposal)	563,000	--
Three times per 66-year life span **(Subtotal)**		**$1,689,000**
Decontamination and Demolition		
116-B Reactor Exhaust Stack[e]	--	1,876,000
105-B Facility[f]	--	13,683,000
Subtotal	**--**	**$15,559,000**
Nondiscounted Grand Total	**--**	**$24,213,000**
Present-Worth (Discounted)		**$4,214,000**

[a]The cost estimate for D&D of the 105-B Facility does not include costs required for preparation for transport and disposal of the 105-B Reactor block. The costs given are based on Calculation Brief No. 0100B-CA-C0017 (BHI 2002).
[b]Cost estimate for a life span of 66 years. The cost estimate is based on the cost estimates from DOE-RL (2000a), Table 4-2, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[c]Cost estimate for a life span of 10 years. The cost estimate is based on 1998 costs from DOE-RL (1998a), Table 4-1, 116-DR Exhaust Air Stack, which were converted to 2002 costs using the 5-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[d]The cost estimate is based on 2000 costs from DOE-RL (2000a), Table 4-2, which were converted to 2002 costs using the 2-year real interest rate on treasury notes and bonds from OMB Circular No. A-94, Appendix C (OMB 1992).
[e]Cost estimates are the D&D and waste volume costs quoted in present-worth dollars (Table 4-1).
[f]Cost estimates are derived from the ISS cost for 105-B (Table 4-1) and subtracting the estimated cost for construction of the SSE, which is $2,606,000, and post-construction S&M, which is $350,000 (Table 4-1).

5.0 ANALYSIS OF ALTERNATIVES

The cleanup action alternatives were evaluated against three criteria: effectiveness, implementability, and cost. To provide a more comprehensive evaluation, this document divides the criterion of effectiveness into several subcategories. The cleanup action alternatives will be evaluated against the following:

- Effectiveness:
  - Overall protection of human health and the environment
  - Compliance with applicable federal and state laws and regulations (e.g., ARARs)
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness

- Implementability

- Cost.

Each criterion is briefly explained in the following subsections. Subsequently, a detailed analysis of each alternative relative to each criterion is provided. Finally, the alternatives are compared against one another relative to each criterion. The alternatives are reiterated below:

- Alternative One: No Action
- Alternative Two: Interim Safe Storage (ISS)
- Alternative Three: Long-Term Surveillance and Maintenance (S&M).

5.1 EFFECTIVENESS

5.1.1 Overall Protection of Human Health and the Environment

The overall protection of human health and the environment is the primary objective of the cleanup action. This criterion addresses whether the action achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. The assessments of the other evaluation criteria are also drawn upon. This criterion must be met for a cleanup action to be eligible for consideration as a final CERCLA removal action. Evaluation of the alternatives against this criterion was based on qualitative analysis and assumptions regarding the inventory of hazards in the facilities to be addressed by the cleanup action.

Alternative One has no components that would eliminate, reduce, or control risks to human health and the environment. Therefore, Alternative One would not provide overall protection of human health and the environment and would not achieve the cleanup action objectives. Because implementation of this alternative would not meet the threshold criterion of protectiveness, it cannot be considered a viable alternative. On this basis, the No Action alternative was not carried through for further evaluation.

Alternative Two would provide overall protection of human health and the environment. Substantial protection would be provided near term by conducting assessment and D&D, constructing the SSE, and disposing of waste to an engineered facility. All contaminated materials from the reactor stack and some contaminated materials from the reactor facility would be removed and disposed of at the ERDF, reducing the potential for a contaminant release. The portions of the reactor facility within the shield walls would not be demolished, but would be encapsulated in a concrete and metal enclosure. This would reduce the potential for a release of remaining contaminants. Protection would be continued for up to 66 years through S&M of the SSE. Because most of the facility would have been demolished, the number of areas that would require S&M would be reduced, thereby reducing the potential for exposing workers to contamination. Additionally, the reactor facility would be monitored remotely and inspections would be reduced to a 5-year schedule, further decreasing the potential for worker exposure. During implementation of these activities, there would be a potential for worker exposure and the potential for release of contaminants. However, the use of proven control technologies and strict adherence to safety and environmental regulations during these activities would significantly minimize these risks. Additionally, lessons learned would be applied from the performance of this work conducted at the 105-C, 105-D, 105-DR, 105-F, and 105-H Facilities.

Alternative Three would also appear to provide overall protection of human health and the environment, although the ability to maintain protection as facility deterioration increases over time creates some uncertainty. For the duration of the S&M period (10 years for the reactor stack and up to 66 years for the 105-B Facility), limited protection would be provided by continued surveillance and appropriate maintenance. At the end of the S&M period, assessment, D&D, and waste disposal would provide more permanent protection as described in Alternative Two. There would be a potential for worker exposure and a potential for a release of contaminants to the environment during both the S&M period and the eventual D&D. However, the use of proven control technologies and strict adherence to safety and environmental regulations would significantly reduce these risks. There are uncertainties regarding the ability to maintain the integrity and protectiveness of the 105-B Facility during the remaining (up to 66) years of the S&M period. The number and magnitude of repairs would likely increase, and some repairs would potentially be insufficient to maintain facility integrity. No specific issues have been identified, but there would be risks associated with unpredictable events, such as a fire or earthquake.

Based on this analysis, Alternative One would fail to provide overall protection. Alternative Two provides overall protection of human health and the environment. Alternative Three also appears to provide overall protection of human health and the environment, although an increasingly more aggressive surveillance and repair effort would likely be needed as deterioration rates increase over time.

5.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses whether a final CERCLA removal action will, to the extent practicable, meet ARARs and other federal and state environmental statutes. The ARARs must be met for onsite CERCLA actions (CERCLA, Section 121[d][2]). Onsite actions are exempted from obtaining federal, state, and local permits (CERCLA, Section 121[e][1]). Nonpromulgated standards are also to be considered, such as proposed regulations and regulatory guidance, to the extent necessary for the removal action to be adequately protective. The ARAR criterion must be met for a cleanup alternative to be eligible for consideration as a final CERCLA removal action.

Key ARARs for the two alternatives being considered include waste management standards, standards controlling releases to the environment, and standards for protection of cultural and ecological resources. The alternatives may include subsurface remediation for some of the facilities within the scope of this document following D&D. Any subsurface remediation would be conducted in accordance with the appropriate 100 Area ROD, including ARARs related to remediation standards as specified in those RODs.

A discussion of how the cleanup action alternatives would comply with the listed preliminary ARARs is provided in the following subsections. Where pertinent to the discussion of compliance, materials to be considered have also been included. Final ARARs, which must be complied with during implementation of the selected removal action, will be documented in the CERCLA Action Memorandum.

5.1.2.1 Waste Management Standards. RCRA Subtitle C, implemented via 40 CFR 260 through 279, governs the identification, treatment, storage, transportation, and disposal of hazardous waste. Authority for much of Subtitle C has been delegated to the State of Washington. Implementing state regulations contained in *Washington Administrative Code* (WAC) 173-303 would be applicable to any dangerous wastes generated during the removal action. The regulations require identifying and appropriately managing dangerous wastes and dangerous components of mixed wastes and identifying standards for treatment and disposal of these wastes. The land disposal restrictions established under RCRA (40 CFR 268) prohibit disposal of restricted wastes unless specific concentration- or technology-based treatment standards have been met. The land disposal restrictions would be applicable to the treatment and disposal of dangerous or mixed wastes that may be generated during the removal action.

Dangerous and mixed wastes would likely be generated under both Alternatives Two and Three. At this time, it is expected that these wastes would be primarily dangerous wastes (e.g., lead-contaminated materials). Some listed wastes (e.g., organic solvents) may also be generated. Both characteristic and listed dangerous or mixed wastes would be designated and managed in accordance with the dangerous waste management standards in WAC 173-303. Any wastes determined to be dangerous or mixed waste would be treated as appropriate to meet the treatment standards of 40 CFR 268. For example, lead-contaminated waste could be encapsulated and disposed of at the ERDF.

The *Toxic Substances Control Act of 1976* (TSCA), implemented via 40 CFR 761, regulates the management and disposal of PCBs and PCB waste. At this time, PCBs are identified as potential contaminants in the 105-B Facility, and PCB-contaminated waste would likely be generated under both Alternatives Two and Three. In accordance with 40 CFR 761, any PCB-contaminated wastes generated would be managed as PCB remediation waste. The ERDF is authorized to accept nonliquid PCB wastes for disposal. All waste suspected to contain PCBs would be evaluated to determine if the waste meets ERDF waste acceptance criteria and disposed of at the ERDF if it meets the criteria. Any PCB waste that does not meet the ERDF waste acceptance criteria would be sent to an onsite PCB storage area meeting the substantive requirements for TSCA storage and would be transported for disposal at a TSCA-approved disposal facility. An offsite determination would require approval by EPA, and Ecology would be notified in this case.

Radioactive wastes are governed under the authority of the *Atomic Energy Act of 1954* (42 U.S.C. 2011). U.S. Nuclear Regulatory Commission performance objectives for land disposal of low-level radioactive waste are provided in 10 CFR 61, Subpart C. Although not applicable to DOE facilities, these standards are relevant and appropriate to any disposal facility that would accept low-level waste generated under this removal action. EPA requirements for disposal of TRU waste are specified under the "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste" (40 CFR 191). This regulation generally prohibits near-surface disposal of TRU waste and establishes disposal methods and requirements that include the expectation that containment will be provided for 10,000 years. Radioactive low-level waste would likely be generated under both Alternatives Two and Three. This waste would be disposed at the ERDF, which is authorized to receive low-level waste resulting from remediation activities, as long as the waste meets the ERDF waste acceptance criteria. Transuranic waste may be generated under Alternatives Two and Three. This waste would be transferred to the CWC for interim storage pending offsite disposal at a geologic repository such as the Waste Isolation Pilot Plant.

Removal of asbestos and asbestos-containing material (ACM) is regulated under the *Clean Air Act of 1955* (40 CFR 61, Subpart M) and by the Occupational Safety and Health Administration (29 CFR 1910.1101 and WAC 296-62). These regulations provide standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation, and to protect asbestos workers. It is possible that some asbestos or ACM would have to be handled during the removal action, either during facility D&D (Alternatives Two and Three) or during S&M (when major repairs are required). In this case, asbestos and ACM would be removed and disposed of in accordance with the cited regulations, including appropriate worker protection and packaging. The asbestos and ACM would be disposed of at the ERDF.

In addition to the ARARs specified above, because both alternatives propose disposal of waste at the ERDF, the ERDF waste acceptance criteria must be met. The ERDF waste acceptance criteria define radiological, chemical, and physical characteristics for waste proposed for disposal placement and compaction requirements. Waste generated during the implementation of either alternative that could not meet or be treated to meet the ERDF waste acceptance criteria would be stored or disposed of at an alternate Ecology- and EPA-approved facility. Any waste disposal occurring at a CERCLA offsite facility requires an offsite determination by EPA and the notification of Ecology.

The *Hazardous Materials Transportation Act of 1974* (49 U.S.C. 1801-1813), implemented via the "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials" (49 CFR 100 through 179), governs the transportation of potentially hazardous materials, including samples and waste. It is applicable to any wastes or contaminated samples that would be shipped off the Hanford Site. Both alternatives would require offsite transportation of potentially contaminated samples and, potentially, of waste. Through implementation of DOE orders and federal procedures, compliance with this ARAR would be achieved for the handling and shipping of wastes and samples.

5.1.2.2 Standards Controlling Releases to the Environment. The *Washington Clean Air Act* (RCW 70.94) regulates both toxic and radioactive airborne emissions. Under implementing regulations found in 40 CFR 61, Subpart H, and WAC 246-247, radionuclide airborne emissions from all combined operations at the Hanford Site may not exceed 10 mrem/yr effective dose equivalent to the hypothetical offsite maximally exposed individual. WAC 246-247 requires verification of compliance, typically through periodic confirmatory air sampling. WAC 173-400 establishes requirements for the control and/or prevention of the emission of air contaminants, including dust.

The radionuclide emission standards would apply to any fugitive, diffuse, and point-source air emissions of radionuclides generated during S&M and D&D activities associated with Alternatives Two and Three. If it is determined that there is a potential for a nonzero radioactive emission, best available radionuclide control technology would be required. Alternatives Two and Three would primarily use decontamination/stabilization of surfaces to control radiological contaminants and standard construction techniques to provide dust control during demolition. An air monitoring plan will be prepared during the design phase.

No liquid discharges are anticipated under either Alternative Two or Three.

5.1.2.3 Cultural and Ecological Resource Protection Standards. The proposed cleanup action would occur in previously disturbed areas; therefore, the likelihood of encountering cultural resources during the removal action would be low. However, if significant artifacts were discovered during project activities, cultural resource laws would be applicable. The *Archeological and Historic Preservation Act of 1974* (16 U.S.C. 469-469c) provides for the preservation of historical and archeological data (including artifacts) that might be irreparably lost or destroyed as the result of a proposed action. Because of the extensive disturbance resulting from their construction, it is unlikely that archaeological remains would be found in the footprint of the reactor or the reactor stack (Neitzel 1999). However, if archeological remains were discovered, a mitigation plan would be developed in consultation with the appropriate authorities.

The *Native American Graves Protection and Repatriation Act of 1990* (43 CFR 10, 25 U.S.C. 3001 et seq.) requires agencies to consult and notify culturally affiliated tribes when Native American human remains are inadvertently discovered during project activities. It is unlikely that work proposed in this document would inadvertently uncover human remains. If human remains were encountered, the procedures documented in the *Hanford Cultural Resources Management Plan* (PNL 1989) would be followed.

The *National Historic Preservation Act of 1966* (16 U.S.C. 470) and its implementing regulations (36 CFR 800) require federal agencies to evaluate and mitigate adverse effects of federal activities on any site eligible for inclusion on the National Register of Historic Places. A total of 14 buildings and structures within the reactor compound have been recorded on historic property inventory forms. Of that number, 10 properties, which include the 105-B Facility, have been determined eligible for the National Register as contributing properties within the Manhattan Project and Cold War Era Historic District recommended for individual documentation (DOE-RL 1998b). Stipulation V(C) of the programmatic agreement requires that an interior assessment be undertaken for the 105-B Facility to identify artifacts that may have interpretive or educational value prior to deactivation, decontamination, or decommissioning activities (DOE-RL 1996). A decision to preserve some of the 105-B Facility would not conflict with the removal of the reactor block, if preservation is physically removing the artifacts for display at a separate location. Preservation of the 105-B Facility at it's current location would ultimately conflict with the decision to remove the reactor block within 66 years as determined in the EIS (DOE 1992) and ROD (58 FR 48509). Under cleanup action Alternatives Two and Three, mitigation measures for compliance under this ARAR may include the following:

- Recordation by photographs, drawings, models, and exhibits
- Written histories
- Preservation of some portions of the 105-B Facility for display on or near its present location
- Preservation of some portions of the 105-B Facility for display at a location other than the 105-B Facility.

These measures would comply with preservation measures required under the *National Historic Preservation Act of 1966* (16 U.S.C. 470) while not impacting the actions necessary to protect human health and the environment.

The *Endangered Species Act of 1973* (16 U.S.C. 1531, 50 CFR 402, and WAC 232-012-297) requires the conservation of critical habitat on which endangered or threatened species depend and prohibits activities that threaten the continued existence of listed species or destroy critical habitat. The *Migratory Bird Treaty Act* (16 U.S.C. 703) makes it illegal to remove, capture, or kill any migratory bird or any part of nests or the eggs of any such birds. Threatened and endangered species are known to be present in the 100 Areas, but no adverse impacts on protected species or critical habitat resulting from implementation of either alternative would be anticipated. Facility-specific ecological reviews would be conducted to identify potentially adverse impacts prior to the performance of any demolition work.

5.1.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion addresses whether the alternative leaves an unacceptable risk after the cleanup action has been taken. It also refers to the ability of a cleanup action to maintain long-term reliable protection of human health and the environment after cleanup action objectives have been met.

Alternative Two is protective of human health and the environment for the long term and provides a permanent remedy for the 105-B Facility in the early years of implementation. Most of the contamination and contaminated structures would be removed and disposed of, thereby creating an effective and permanent remedy with regard to the reactor stack. The SSE structure would be designed to last for 66 years with proper maintenance and monitoring; therefore, this component of the alternative would provide an effective solution for containing the contamination in the reactor block for the long term. This alternative would provide a permanent solution with respect to the reactor stack and would involve planning for the transportation and disposal of the reactor block to the 200 Area Plateau during the 66-year ISS period.

Under Alternative Three, S&M would be carried out until the eventual D&D of the facilities, assumed to occur within 10 years for the reactor stack and within 66 years for the 105-B Facility. Therefore, the alternative could be as effective as Alternative Two in protecting human health and the environment in the long term, although the efforts to maintain that level of protection would necessarily become increasingly aggressive as the facilities age. Because contamination would be left in place for an extended period with this alternative, the risk of exposure and release would remain and increase with time. Therefore, over the long term, the ability of this alternative to remain protective may actually diminish. Planning for the transportation and disposal of the reactor block would be required during the 66-year S&M period.

Alternatives Two and Three provide permanent and protective solutions for the reactor stack and require planning for the transportation and disposal of the reactor block within 66 years. The reactor stack would be decontaminated and demolished and contaminated materials would be disposed of in the ERDF, which would provide reliable protection. Alternative Two is considered to achieve long-term protectiveness more reliably and effectively than Alternative Three. Under Alternative Two, the reactor stack would be addressed much earlier than in Alternative Three. In addition, the SSE structure that would be constructed as part of Alternative Two would provide better long-term protection of human health and the environment for contamination associated with the reactor block.

5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

The reduction of toxicity, mobility, or volume through treatment criterion refers to an evaluation of the anticipated performance of the treatment technologies that may be employed in a cleanup action. It assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. This could be accomplished by destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants. Reduction of toxicity, mobility, and/or volume contributes to overall protectiveness.

Both Alternatives Two and Three would generate waste that might require treatment as necessary to meet waste acceptance criteria at ERDF or other disposal facilities. However, the fraction of waste requiring treatment would likely be low, and neither alternative would involve a specific treatment technology as part of the cleanup action. The volume of waste requiring treatment would be the same for both alternatives. Therefore, neither toxicity, mobility, nor volume would be significantly reduced through treatment, nor would there be a difference between the alternatives. Alternatives Two and Three would employ recycling options for nonregulated material to reduce the volume of disposed material.

5.1.5 Short-Term Effectiveness

The short-term effectiveness criterion refers to an evaluation of the speed with which the remedy achieves protection. The criterion also refers to any potential adverse effects on human health and the environment during the implementation phases of the cleanup action.

There would be a potential for worker exposure and releases to the environment in implementing both Alternatives Two and Three. During implementation, Alternative Two would increase potential exposure to workers early in the cleanup action, because the workers would be entering the contaminated facility more often and would be handling contaminated materials as part of D&D. The handling of contaminated materials would also increase the potential for a release to the environment, especially to the air. Strict adherence to all appropriate environmental regulations would ensure that the potential to release would be minimized. Limiting workers' time in contaminated areas and providing the necessary protective clothing and equipment appropriate to the tasks would mitigate the risk to workers. During the S&M period following D&D and construction of the SSE structure, the potential for a release to the environment or exposure to workers would decrease substantially. All contaminated materials from the reactor stack and some contaminated materials from the reactor facility would be removed and disposed of at the ERDF, reducing the potential for a contaminant release. The portions of the reactor facility within the shield walls would not be demolished, but would be encapsulated in a concrete and metal enclosure, containing any remaining contamination inside. This would reduce the potential for a release of remaining contaminants. Because portions of the facility would have been demolished, the number of areas that would require S&M would be reduced, thereby reducing the potential for exposing workers to contamination. Additionally, the reactor facility would be monitored remotely and inspections would be reduced to a 5-year schedule, further decreasing the potential for worker exposure. This alternative could span 66 years, including a reduced program of surveillance and routine maintenance following D&D and construction of the SSE. However, the key cleanup action objectives would have been achieved and the potential risks to human health and the environment would be significantly reduced in the short term.

Alternative Three would protect the environment in the near term by maintaining the facilities in a condition that would minimize the potential for a release. There would be a potential for exposure to workers during the S&M period as they enter the contaminated facility to perform work. This potential for exposure would become greater as the facility deteriorates and the need for increased surveillance and major repairs arises. There would be a further increase in worker exposure and the potential for a release (comparable to Alternative Two) when the reactor facility finally undergoes D&D within 66 years. The cleanup action objectives would not be achieved until the end of the 66-year period.

Alternative Two is considered more effective in achieving protectiveness in the short term than Alternative Three. The risk to workers and potential for releases would likely be greater with Alternative Two early in the cleanup action. However, once the reactor stack is decontaminated and demolished and the SSE structure is constructed, the potential for exposure or a release would be significantly reduced. Exposure and the potential for a release would increase over time in Alternative Three, with a peak when D&D finally occurs (within 10 years for the reactor stack and 66 years for the 105-B Facility). Thus, over the 66-year period, Alternative Two would have a lower cumulative potential for worker exposure and releases to the environment. In addition, Alternative Two would have fewer uncertainties with respect to its ability to ultimately achieve protectiveness than Alternative Three.

5.2 IMPLEMENTABILITY

Implementability refers to the technical and administrative feasibility of a cleanup action, including the availability of materials and services needed to implement the selected solution.

Alternative Two is implementable. Environmental restoration workers at the Hanford Site are experienced in performing D&D and waste disposal operations. In addition, DOE has successfully completed the ISS project for the 105-C Facility and is making significant progress on the 105-DR, 105-F, 105-D, and 105-H D&D and ISS projects. Techniques and lessons learned from those projects would be applied to the ISS of the 105-B Facility, as well as the D&D of the reactor stack. The specialized skills that would be required to design and construct the SSE are readily available within the existing work force at the Hanford Site. Materials that would be needed to complete the SSE are easily obtained. In terms of waste disposal, the ERDF has been designated by a ROD (EPA 1995) to receive CERCLA wastes generated on the Hanford Site that meet its acceptance criteria. The facility has already been constructed and has been in operation for several years. Procedures for handling waste at the ERDF are well established. Therefore, the facility and processes for disposal of waste generated under this alternative are readily available. Implementation of S&M following D&D and construction of the SSE structure is efficient because the reactor stack would be demolished and surveillance requirements for the stabilized 105-B Facility would be significantly reduced.

Alternative Three also could be implemented, at least in the near term. Surveillance and maintenance techniques are widely used throughout the Hanford Site, and no specialized materials or services would be required except when major repairs would be needed on a contaminated facility. As time passes, the primary difficulty with implementation would be the increasing deterioration of the facility. This would result in possibly increasing the potential for worker exposure or physical hazards, although these risks would be mitigated through appropriate health and safety precautions. The deterioration would also present increasing challenges in attempting to maintain the integrity of the facility to prevent contaminant releases. The difficulty in implementing D&D at the end of the S&M period would be comparable to

Alternative Two, except that there would be no need to construct an SSE structure for the 105-B Facility. The Hanford Site work force would likely have decreased in 66 years, affecting the availability of a trained work force; minimum specialized skills would be required for D&D, so construction labor forces could be drawn from the surrounding community, if necessary. The availability of a waste disposal facility would be uncertain. The ERDF is likely to be closed by that time. Either the ERDF would need to be reopened and expanded and operations resumed or another waste disposal facility would be required.

Both Alternatives Two and Three would be implementable. In the near term, Alternative Three may be easier to implement because it would not include the engineering and design phases that would be associated with construction of the SSE structure, as in Alternative Two. However, in the long term, implementation of Alternative Three may become less feasible, as S&M activities would become more aggressive and more frequent and present greater worker protection and engineering challenges. In contrast, the long-term S&M activities required for Alternative Two would be very feasible because the reactor stack would be gone and the SSE structure would require minimal S&M. Overall, Alternative Two would be expected to be more implementable than Alternative Three, based on previous experience, available resources, operational disposal facilities, and an experienced work force.

5.3 COST

The cost criterion evaluates the cost of the alternatives and includes capital, operation and maintenance, and monitoring costs. Neither cost estimate for Alternatives Two or Three includes costs required for transport and disposal of the 105-B Reactor block.

As shown in Tables 4-1 and 5-1, the nondiscounted cost estimate for Alternative Two is approximately $18.8 million. Included in the estimate is the ISS of the reactor facility, estimated at $16.3 million for 105-B Facility, as well as D&D of the 116-B Reactor Exhaust Stack, estimated at $1.9 million (Table 4-1). Post-construction S&M of the reactor for the 66-year period is estimated at $712,000. Thus, the total nondiscounted cost of Alternative Two would be approximately $18.8 million. The present-worth cost associated with Alternative Two is approximately $18.4 million. The cost estimates for Alternative Two have been based, in part, on the actual costs that have been experienced in implementing ISS at the 105-C and 105-D Facilities, which have many cost components similar to Alternative Two.

The total nondiscounted cost estimate for Alternative Three, as shown in Table 5-1, is approximately $24 million. Costs include conducting surveillance operations and routine maintenance on the reactor stack for up to 10 years and on the reactor facility for up to a 66-year period per the EIS ROD (58 FR 48509). The S&M portion of the cost is estimated at $7 million. Also included in the estimate is the major cost component for roof replacement on the reactor facility, which is assumed to be required every 20 years. Over a 66-year period, this would cost an estimated $2 million. Because the reactor facility would still need to be decontaminated and demolished, the cost estimate includes $16 million to perform this activity. The discounted present-worth cost associated with Alternative Three is approximately $4.2 million.

As stated in Section 4.3, several uncertainties are associated with the cost estimate for Alternative Three. The cost to maintain the facilities cannot be accurately predicted and therefore cannot be accurately amortized into present-worth estimates. If the facilities were to deteriorate at a rapid rate and repairs were inadequate to maintain protection of workers, the public, and the environment, D&D of the reactor facility may need to be performed before the end of the 66-year period. The cost of major repairs (beyond the roof replacements) cannot be predicted. Therefore, the estimated cost for Alternative Three represents a minimum.

Aside from the total cost differential between the two alternatives, some additional differences should be noted. For example, the timing of expenditures would be significantly different. With Alternative Three, annual expenditures would be incurred over a 10-year period for the S&M of the reactor stack and over a 66-year period for the 105-B Facility. The 10-year S&M period for the reactor stack would then be followed by D&D of these facilities. For the 105-B Facility, the S&M program would likely become more aggressive over the course of a 66-year period. At the end of the 66-year period, or before then, another large expenditure would occur for the D&D function of the reactor facility. For Alternative Two, the majority of the expenditure would occur in the early years of implementation. After the reactor stack was decontaminated and demolished and the SSE structure was in place, the S&M cost would drop to only a few thousand dollars per year. The other primary difference between the cost of these alternatives is that, given the uncertainties associated with Alternative Three, the cost for Alternative Two can be much more accurately predicted. Given these differences, Alternative Two may more effectively achieve the cost objectives than Alternative Three. Alternative Two would also be better at satisfying the cleanup action objective relating to reducing or eliminating future S&M costs.

5.4 OTHER CONSIDERATIONS

This section evaluates NEPA values (e.g., analysis of cumulative, offsite, ecological, and socioeconomic impacts) to the extent practicable.

Cumulative impacts may occur in both the short term and the long term because of the interrelationships among other activities occurring in the 100 Areas. Other current or future activities in the 100 Areas include the following:

- Remediation of waste sites, groundwater, and burial grounds in the reactor areas
- Safe storage activities at the 105-D and 105-H Facilities
- Storage and removal of spent fuel contained in the basins at the 100-K Area
- D&D of ancillary facilities in the 100 Areas
- Disposition of the reactor blocks.

These activities are expected to be ongoing sometime in the near future (about 5 years), with the exception of removal of the reactor blocks. The reactor blocks are expected to be addressed within 66 years. Each of these activities contributes toward meeting the goals of 100 Area remediation, including protection of the Columbia River. However, due to the competition of financial resources to accomplish the work, each activity competes with others for priority allocation of funding. In addition, each of the activities presents the potential for offsite impacts such as airborne releases.

Near-term D&D of the reactor stack and reactor facility, including ISS of the reactor facility (Alternative Two), would require a significantly greater commitment of budget resources (including waste disposal costs, workers, equipment, and supplies) in the near term than would be required to perform S&M (Alternative Three). Therefore, in the near term, Alternative Two would impose a greater cumulative burden in terms of additional competition for remediation dollars and work force resources than Alternative Three.

In the long term, the overall cumulative objective of the 100 Area activities is to enhance the protection of workers, the public, and the environment, which is consistent with the values expressed by the regulators, stakeholders, affected Tribes, and the public. Alternative Three would not be as protective over a 66-year period as Alternative Two and thus would not be as consistent with these objectives. In the long term, completion of Alternative Two would be consistent with and supportive of the overall cumulative benefits that will be derived from the remedial activities in the 100 Areas.

Offsite impacts include potential effects on the public or the environment due to the release of contaminants resulting from an activity being performed at the Hanford Site. Alternative Three would not be expected to result in adverse offsite impacts in the near term and thus would not add to the cumulative impact of other near-term activities in the 100 Areas. Alternative Two could potentially result in airborne emissions of radioactive contaminants in the near term, but these impacts are expected to be low based on experience with D&D and ISS activities at other facilities. Therefore, Alternative Two would not be expected to contribute significantly to overall cumulative impacts.

Neither alternative would be expected to affect existing natural resource conditions. Although federally listed bald eagles frequent the Columbia River during the winter, there are no identified roosts near the 100-B/C Area that would affect work on the 105-B Facility (DOE-RL 1994). The area where work would be performed is not identified as critical habitat for any listed species. However, prior to commencing any field activity, an ecological review of the facility and surrounding area would be conducted to ensure that there would be no impacts to natural resources of special concern (e.g., migratory birds).

Disturbance maps indicate that, due to previous Hanford Site era construction activities, no archeological deposits likely remain intact in the immediate vicinity of the reactor area. However, with implementation of either alternative, cultural resource surveys would be conducted before any proposed work started. If surveys indicate the presence of cultural resources, a mitigation plan would be developed.

Because the 105-B Facility has been determined eligible for the National Register as a contributing property within the Manhattan Project and Cold War Era Historic District (DOE-RL 1998b), mitigation measures required to comply with the *National Historic Preservation Act of 1966* (16 U.S.C. 470) will be implemented. Mitigation efforts would be implemented in coordination with the State Historic Preservation Office.

Both alternatives would require an irreversible and irretrievable commitment of resources in terms of land that would be committed to the ERDF and the borrow pit that would supply clean backfill. In addition, if new haul roads or other infrastructure were needed to implement either alternative, this would constitute an irreversible and irretrievable commitment of resources in terms of land during the time that the infrastructure was being used.

Socioeconomic impacts from implementing either alternative would be minimal. In the near term, the work force required for Alternative Three would be small. In the long term (up to 66 years), Alternative Three may require support from some non-Hanford Site work forces, but the number of resources would not be large and this would not be expected to have a significant cumulative impact on the community. Personnel required to implement Alternative Two would be selected from existing S&M and remediation work force resources at the Hanford Site, or the opportunity to fill these positions would be made available to subcontractors.

Table 5-1. Cost Comparison for Final Configuration Alternatives for the 105-B Reactor.

Alternative	Present-Worth Cost	Nondiscounted Cost
Alternative 2 - Interim Safe Storage	$18,408,000	$18,787,000
Alternative 3 - Long-Term S&M	$4,214,000	$24,213,000

6.0 FUTURE ACTIONS

This document presents three alternatives for cleanup actions at the 105-B Reactor Facility and 116-B Reactor Exhaust Stack. The alternatives identified and evaluated in this document may be identified as removal action alternatives in a future CERCLA evaluation, meeting the requirement established by the Tri-Parties to prepare an EE/CA for final removal action for the 105-B Facility by September 30, 2005, per Tri-Party Agreement Milestone M-093-25. After a complete list of alternatives, which may include but are not limited to those presented in this document, have undergone public review and comment, DOE, EPA, and Ecology will evaluate public comments and select the preferred removal action to address the 105-B Facility and the 116-B Reactor Exhaust Stack. The recommended alternative to conduct a removal action at the 105-B Facility and reactor stack will be based on its overall ability to provide protection of human health and the environment and its effectiveness in maintaining protection for both the short term and long term. The selected alternative would provide the best balance of protecting human health and the environment, protecting workers, meeting the removal action objectives, achieving cost effectiveness, and providing an end state that supports and is consistent with future cleanup actions and commitments in the Tri-Party Agreement (Ecology et al. 1998).

7.0 REFERENCES

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